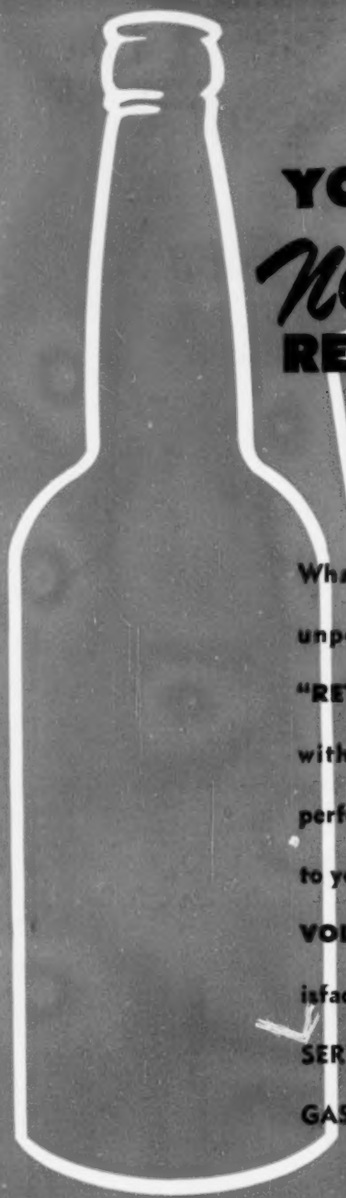
World Petroleum

MARCH 1954

FIVE DOLLARS PER YEAR, ONE DOLLAR PER COPY

Drilling and Exploration Issue



YOUR MOTOR FUEL *Needs* RETAINED VOLATILITY *too!*

What makes a once-lively drink stale, flat and unpopular? Lost volatility. Motor fuel without **"RETAINED VOLATILITY"** gained by blending with NATURAL GASOLINE soon goes flat in performance . . . with results definitely unprofitable to you. To be sure your gasoline has the **"RETAINED VOLATILITY"** that gives consistent and uniform satisfaction to your customers, rely on WARREN'S SERVICE for the quality and quantity of NATURAL GASOLINE you need . . . where and when you want it.

WARREN

PETROLEUM CORPORATION

TULSA, OKLAHOMA • Cable Addresses: STAVOLENE, WARREN

EXPORT TERMINALS: CORPUS CHRISTI, PORT ARTHUR, BAYTOWN
TEXAS CITY AND WARRENGAS, HOUSTON, TEXAS

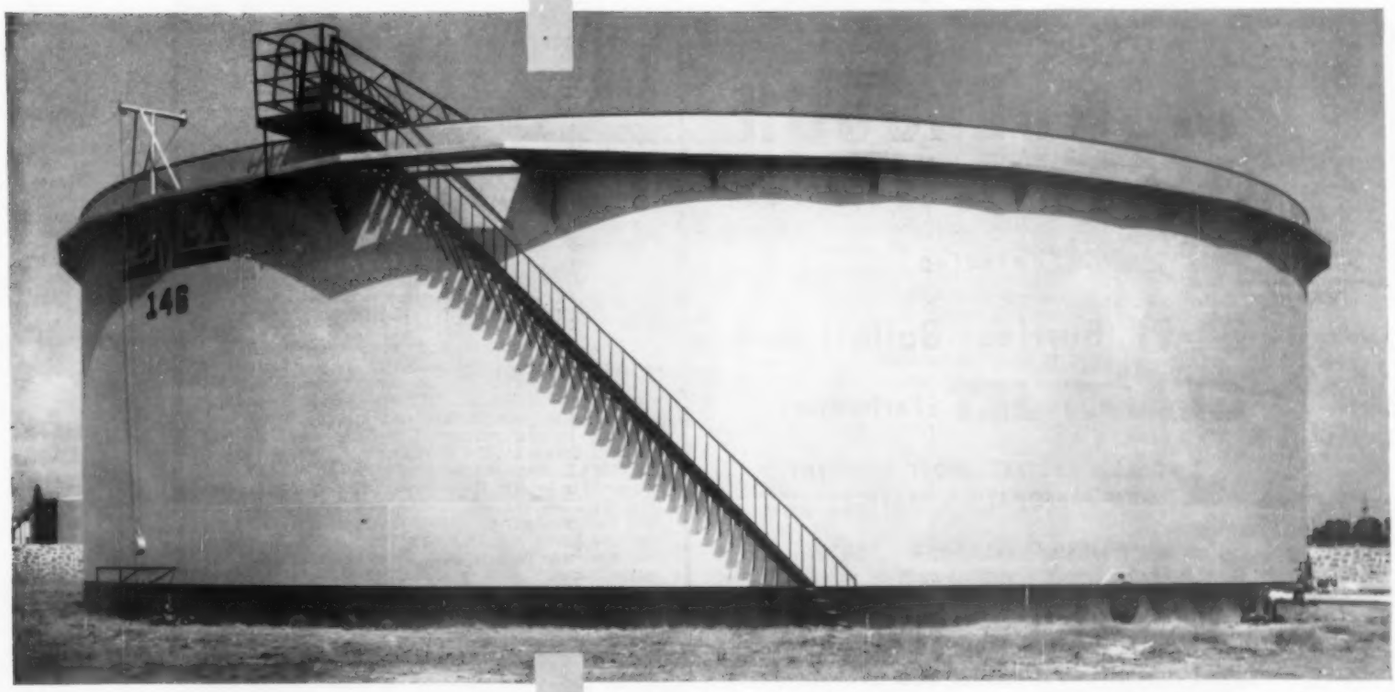
modern equipment

. . . that solves an old problem

Tanks equipped with Horton® Floating Roofs are reducing evaporation losses from volatile hydrocarbons throughout the petroleum industry today. Floating directly on the surface, the entire bottom of a Horton Floating Roof is normally in contact with the liquid in the tank. There is no air-vapor mixture above the liquid. The absence of the vapor space reduces evaporation loss, fire hazard and corrosion.

All Horton Floating Roofs are equipped with the Horton Seal, a device used to close the space between the deck of the roof and the tank shell. Assuring the utmost in efficiency, the Horton Seal has vertical flexures every 22 inches to allow the sealing ring to conform to the contours of the tank shell.

Horton Floating Roofs are built in three types: Double-Deck, Pontoon and Pan. Write our nearest office and let us help you select the type most suited to your operation. There is no obligation on your part.



HORTON Welded Steel Plate Structure for the Petroleum Industry

Horton Floating Roofs	Hortondome Roofs	Horton Elevated Tanks
Hortonspheres	Vaporspheres	Flat-Bottom Tanks
Hortonspheroids	Vaportanks	Refinery Towers

CHICAGO BRIDGE & IRON COMPANY

Atlanta • Birmingham • Boston • Chicago • Cleveland • Detroit • Houston • Los Angeles • Philadelphia • Pittsburgh • Salt Lake City • San Francisco • Seattle • Tulsa
Plants: Birmingham, Chicago, Salt Lake City and Greenville, Pa., U.S.A.
Export Office—165 Broadway Building, New York 6, N. Y., U.S.A.

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What's NEW

In Perforating, Logging, and Fishing Tool Services

Latest News About New Tools, Techniques and Services

MORE PRODUCTION

...Is only PART OF THE STORY

— IN ADDITION, McCULLOUGH PERFORATING SERVICE OFFERS YOU OTHER ADVANTAGES THAT MEAN LOWER COST, MORE SUCCESSFUL WELL COMPLETIONS.

Here are a few of them:

McCULLOUGH

Perforating Service

Featuring

M-3 (Burrless Bullet) and GLASS JET Perforators

"WORLD'S FASTEST, MOST EFFICIENT GUN PERFORATING SERVICE"

Our 32-page, illustrated booklet, "How To Get More Oil," gives the full story of how you benefit by using McCullough Perforating Service. If you have not received your copy, send for it TODAY!

SAVES RIG TIME

Simultaneous firing of Burrless Bullets or Glass Jets in single or multiple zone completions—plus record breaking efficiency of McCullough perforating crews and equipment (7752 Burrless holes in 73 hours) save operators thousands of hours of rig time every year.

EXAMPLE: Shot 136 holes in 4" liner at 6752 feet in one electric wire line run, using McCullough Standard Casing Glass Jet Perforator in 34 foot Steel Strip Carrier. Time on the job—one hour, twenty minutes. Production—528 barrels per day.

DEEPER PENETRATION

"First time" job completion saves rig time and money. Improved firing power of both the McCullough M-3 (Burrless Bullet) and Glass Jet Perforators gain up to 25% deeper penetration than formerly—even under severest well conditions. More than ever, they are the "hardest shooting perforators in the world."

EXAMPLE: Excessively thick cement sheath behind 7" O.D., 23 lb. casing. Well previously perforated by two different companies without results. Six shots at approximately 6690 feet with a McCullough Super Casing Glass Jet Perforator and Steel Strip Carrier resulted in 100 B/D—in only two hours rig time.

"PIN-POINT" ACCURACY

Extremely accurate wire line measurements, double-checked by electronic instrumentation, puts the shots where they count. Greatest assurance of successful job completion can be realized by perforating on the reliable information furnished by the McCullough Radiation Well Logger with Scintillometer.

The extreme accuracy of this amazingly efficient instrument will reliably measure, define and interpret the nature of the zone or intervals to be perforated—regardless of thickness. The simultaneous recording of a collar log is a further assurance of "pin-point" accuracy in perforating. For better results—Log AND Perforate by McCullough.

EXAMPLE: Except for a small trace of oil, this well appeared to be dry. However, the McCullough Radiation Well Logger with Scintillometer picked up a four foot stringer of porous limestone at 3013 feet, confined above and below by shale beds. This four foot zone was perforated with 16 holes by a McCullough Standard Casing Glass Jet Perforator. Production—150 barrels of oil per day from what otherwise might have been a dry hole. Time on the job—only six hours to log and perforate.

PERFORATING, RADIATION LOGGING, AND FISHING TOOL SERVICE—ANYWHERE—ANYTIME.

McCULLOUGH TOOL COMPANY
5820 South Alameda Street, Los Angeles 58, California
405 McCarty Street (P. O. Box 2575) • Houston, Texas
CABLE ADDRESS: MACTOOL
EXPORT OFFICE: Los Angeles, California
CANADA: Edmonton, Calgary, Grande Prairie, Alberta; Regina, Sask.
VENEZUELA: United Oilwell Service Co., S.A.; Caracas, Anaco, Maracaibo

SERVICE LOCATIONS: TEXAS: Houston, Snyder, Alice, Cisco, Corpus Christi, McAllen, Odessa, Tyler, San Angelo, Victoria, Wichita Falls, Luling, Beaumont, Sherman, Midkiff, El Campo. **OKLAHOMA:** Oklahoma City, Guymon, Healdton, Hominy, Wewoka. **ARKANSAS:** Magnolia. **MISSISSIPPI:** Laurel. **NEW MEXICO:** Hobbs. **KANSAS:** Great Bend. **WYOMING:** Casper, Cody, Newcastle. **CALIFORNIA:** Los Angeles, Avenal, Bakersfield, Ventura. **LOUISIANA:** Houma, Lake Charles, New Iberia, Shreveport. **COLORADO:** Sterling. **NORTH DAKOTA:** Williston. **UTAH:** Vernal.

WORLD PETROLEUM for March, 1954. Vol. 25, No. 3. March, 1954. WORLD PETROLEUM is published monthly by Mona Palmer, Trustee under the will of Russell Palmer, 604 Fifth Ave., New York 20, N. Y. Acceptance at East Stroudsburg, Pa., under Section 34.64 P. L. & R. Authorized. Subscription rate: $5.00 per year, single copies $1.00.

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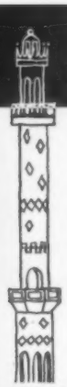
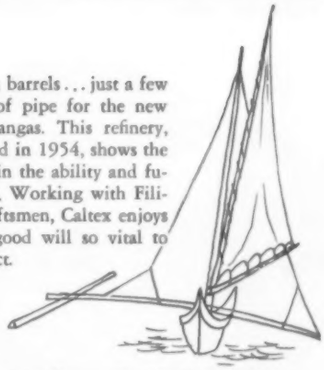
NEW ZEALAND—Near majestic Mt. Egmont lies New Plymouth, largest city of Taranaki Province. This scenic land is the world's largest exporter of dairy products and lamb, ranks second in exports of wool. Caltex is proud to be a part of this scene . . . glad to help an enterprising country take its place in the modern world.



BAHRAIN—The contrast of old and new in this colorful shaikhdom is shown graphically here. The Bahraini's lateen-rigged dhow, Bahrain's traditional fishing and pearling craft, sails gracefully through the waters of the Persian Gulf. In the background we see a modern refinery and Sitra Wharf where tankers take on refined oil products for delivery to markets halfway 'round the world.

PHILIPPINES—Not gun barrels . . . just a few sections of the miles of pipe for the new Caltex refinery at Batangas. This refinery, which will be completed in 1954, shows the confidence of business in the ability and future of the Philippines. Working with Filipino engineers and craftsmen, Caltex enjoys the co-operation and good will so vital to such an immense project.



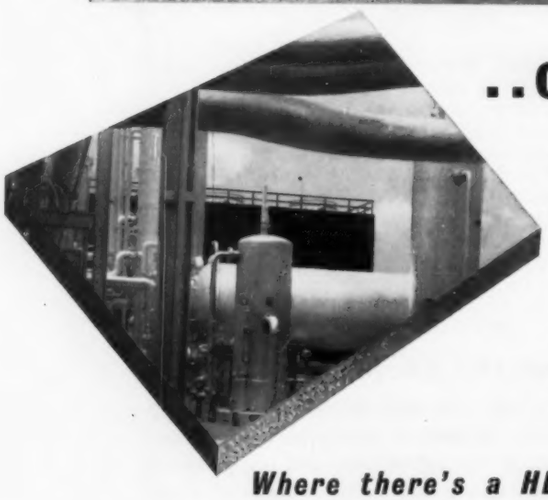
Caltex serves the people of 67 lands

In 67 lands, across half the world, through such developments as these, Caltex is able to supply better fuels and lubricants for industry, for agriculture, and for motoring millions. These require a continual investment of funds and skills, backed by a faith in a better future for free nations.

CALTEX

CALTEX Petroleum Products

SERVING EUROPE • AFRICA • ASIA • AUSTRALASIA



..only part of the picture

OIL REFINERY ENGINEERS know that Newalls bring more than materials to the site, because they realise that even first class insulation materials cannot do justice to themselves unless they are efficiently applied. In fact, the task of planning that the right materials are used is a job studied carefully by Newalls before their recommendations are submitted. Through consultation with Newalls you can make very certain that method as well as materials is brought to bear on the problem. That's maybe why Newalls record of refinery insulation jobs makes such an impressive picture.

Where there's a HEAT INSULATION problem

there's a job for **Newalls**

NEWALLS INSULATION CO. LTD. *Head Office*, Washington, Co. Durham. *A member of the* TURNER & NEWALL ORGANISATION
Offices and Depots at LONDON, GLASGOW, MANCHESTER, NEWCASTLE UPON TYNE,
BIRMINGHAM, BELFAST, BRISTOL & CARDIFF. *Agents and Vendors in most markets abroad*

General Electric Announces...

A NEW MILESTONE IN MOTOR HISTORY

1878: *Thomas Edison builds an electric motor for his Menlo Park "Express"*

1910: *G.E. establishes motor leadership in the infant electric industry*

1925: *G.E. adds 4 times more power per pound as it develops newer motor models*

1939: *the first Tri-Clad motor sets a 14-year standard...becomes the most copied motor in the industry*

New TRI 55 CLAD motor climaxes 75 years of engineering leadership!

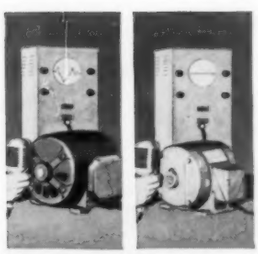
The General Electric Tri/Clad '55' is an important milestone in motor history. For this is a *completely new motor*. Born out of thousands of engineering man-hours, the Tri/Clad '55' incorporates design improvements that go far beyond mere modifications. Many years of pure research, the discovery of new, better materials, the knowledge of how to make better use of present materials, and improved manufacturing processes all make the Tri/Clad '55' motor the new leader in the motor field.

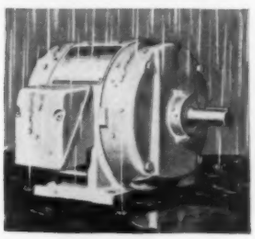
You as a motor user should take the opportunity to see and test this motor for yourself. Contact your nearest General Electric distributor to see the new G-E Tri/Clad '55'. International General Electric Co., 570 Lexington Ave., New York 22, N. Y., U. S. A. 1A-54-2E

Progress is our most important product

GENERAL ELECTRIC

—U. S. A.—





DESIGNED FOR BETTER PERFORMANCE:

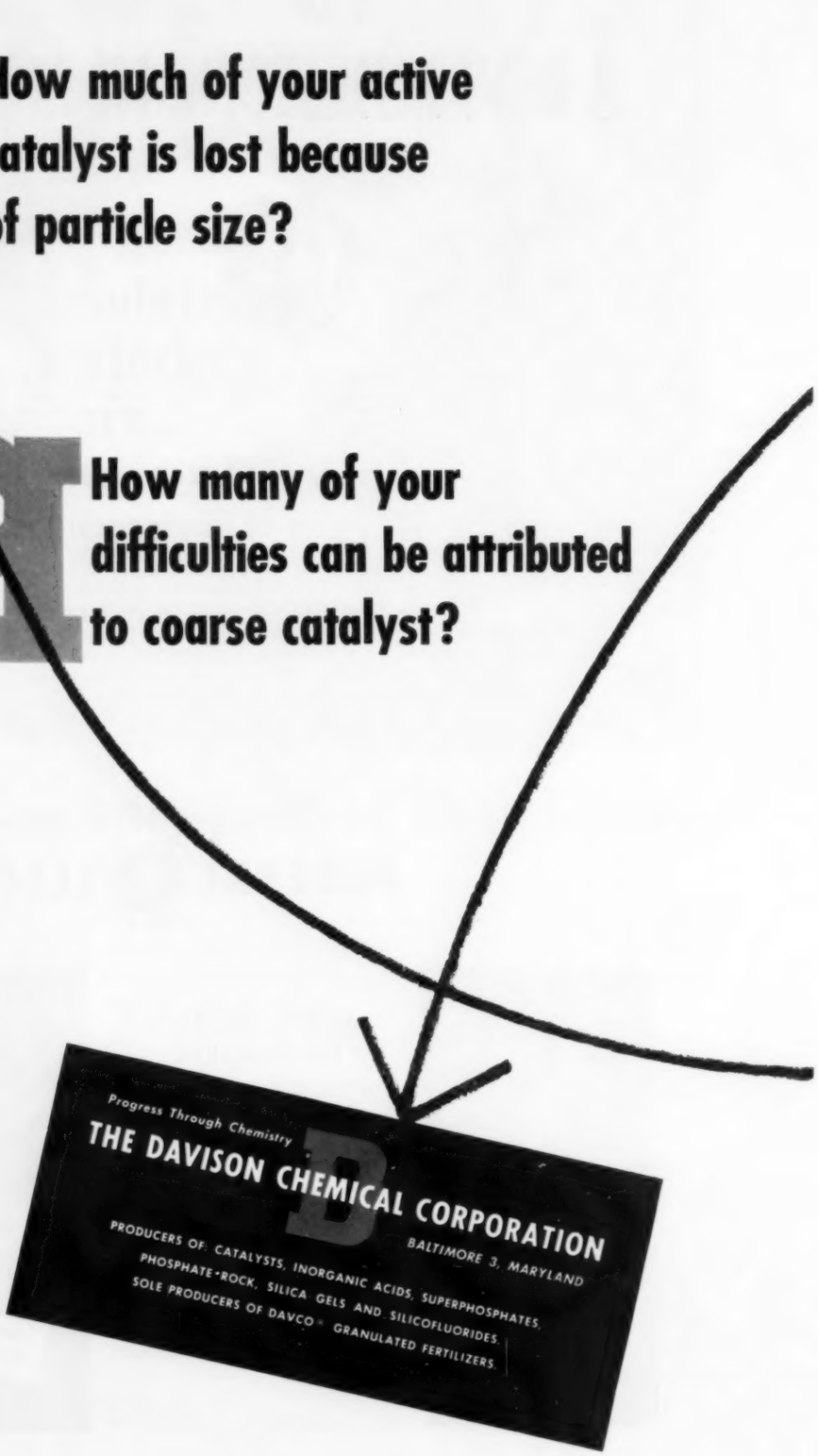
Tri/Clad '55' has a low noise level . . . gives you up to 53% increase in shaft output per pound . . . has higher full-load speeds.

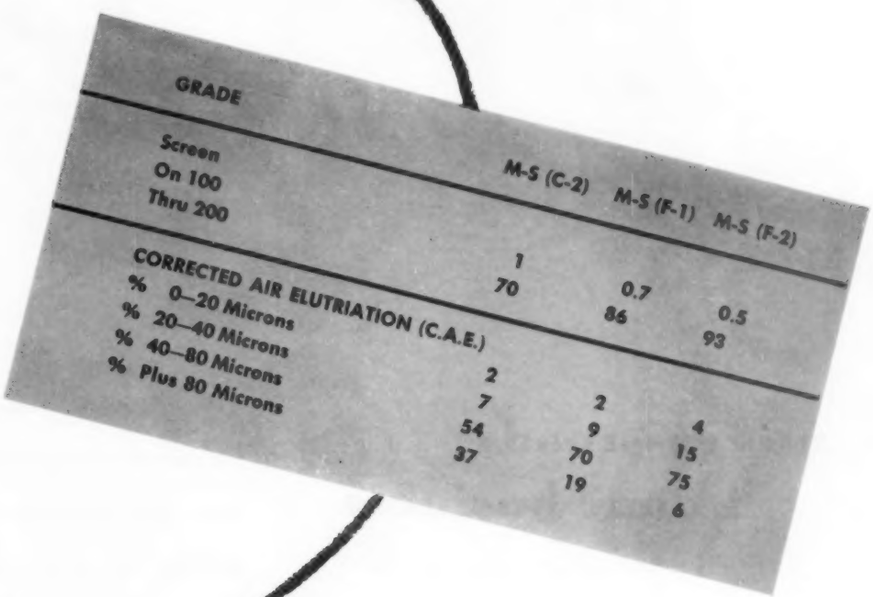
BUILT TO LAST LONGER:

cast-iron strength . . . more fully enclosed dripproof construction . . . water-shedding stator windings . . . polyester film insulation eight times stronger.

How much of your active catalyst is lost because of particle size?

How many of your difficulties can be attributed to coarse catalyst?


Progress Through Chemistry
THE DAVISON CHEMICAL CORPORATION
BALTIMORE 3, MARYLAND
PRODUCERS OF: CATALYSTS, INORGANIC ACIDS, SUPERPHOSPHATES, PHOSPHATE-ROCK, SILICA GELS AND SILICOFLUORIDES.
SOLE PRODUCERS OF DAVCO® GRANULATED FERTILIZERS.



GRADE	M-S (C-2)	M-S (F-1)	M-S (F-2)
Screen			
On 100	1	0.7	0.5
Thru 200	70	86	93
CORRECTED AIR ELUTRIATION (C.A.E.)			
% 0—20 Microns	2	2	4
% 20—40 Microns	7	9	15
% 40—80 Microns	54	70	75
% Plus 80 Microns	37	19	6

an outstanding characteristic of DAVISON'S M-S® catalysts

are their narrow range of particle size distribution. There is a minimum of fines—a minimum of coarse. This is important to you!

The fines in your fresh active catalyst may be lost because the unit is unable to retain them. Coarse catalyst has an adverse effect on catalyst circulation . . . bed density . . . regeneration . . . fluidization.

Here are typical production analyses of Davison M-S Catalysts. One of these grades should fit into your operations. For help in selecting your catalyst or other information call your Davison Field Service Engineer or write.

no crossroads in our business

Universal develops new processes and perfects new refining techniques for one purpose only—that of making them immediately available to every petroleum refiner so that refinery economics may be improved and better products may be made from petroleum.

An excellent example of this policy is the Platforming process. Just as soon as the process was developed and perfected it was offered to the entire petroleum refining in-

dustry so that refiners could quickly apply it to their individual needs. Likewise, as improvements were made in both the process and operating techniques, the information was available to each Platforming licensee.

This is typical of Universal's continued interest in the refiner's welfare. The success of our company depends almost completely upon our ability to help him—to provide processing advances that will permit the refiner to improve his products and his position as a major factor in the economy of America and the world.

There are No Crossroads In Our Business. The path is straight and well defined, leading to but one goal—that of providing a comprehensive service through which the petroleum refiner can benefit to the greatest possible degree.

UNIVERSAL OIL PRODUCTS COMPANY

UOP®

30 ALGONQUIN ROAD, DES PLAINES, ILL., U. S. A.
Laboratories: RIVERSIDE, ILLINOIS

Universal Service Protects Your Investment

ELECTRICAL EQUIPMENT

by

B
T-H

for the oil industry

From oil fields to refinery, be it heavy generating plant or the smallest of flameproof motors, BTH is well-placed to meet the electrical needs of this important industry. The technical and manufacturing resources of BTH, backed by fifty-four years' experience, ensure a standard of performance and reliability over a wide range of products second to none.

for plant of proved performance

SPECIFY BTH

THE
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AMERICA'S No.1 WORK HORSE

Works Continuously to Bring Better Products to Everyone – Everywhere!

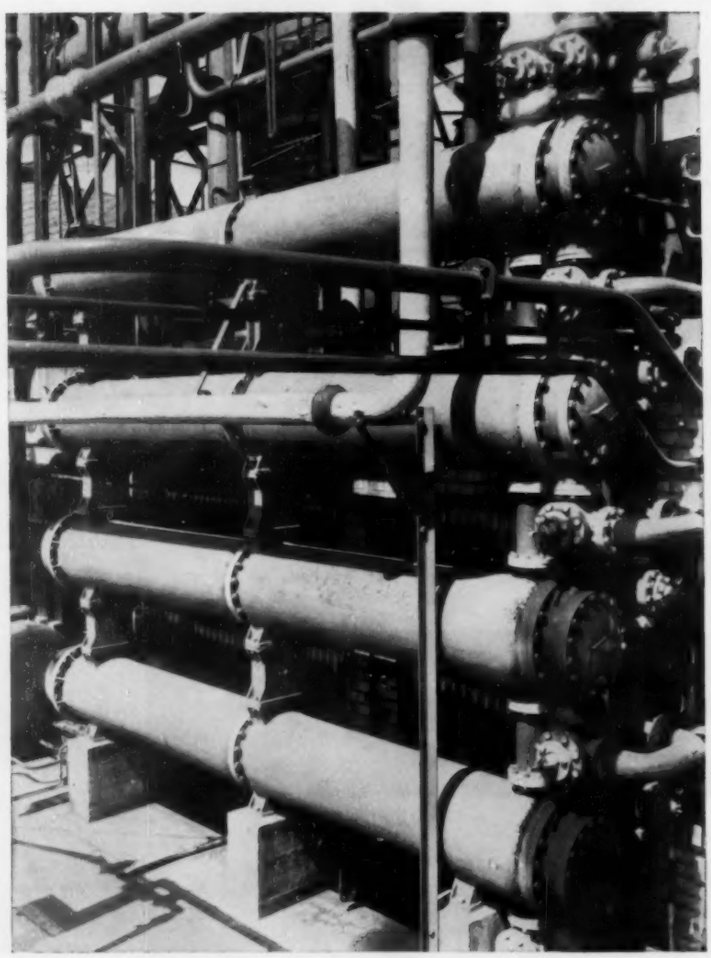
SOCONY-VACUUM OIL COMPANY, INC.

and Affiliates:

MAGNOLIA PETROLEUM COMPANY • GENERAL PETROLEUM CORPORATION

Maintenance man installing new Audco-Nordstrom valve on a methylated spirits (methanol) line in a recently constructed petrochemical plant.

Audco-Nordstrom valves installed on heat exchangers in a refinery.



REFINERIES AND PETROCHEMICAL PLANTS —

TWO GROWING MARKETS FOR AUDCO-Nordstrom VALVES

There is a steadily increasing demand for Audco-Nordstrom valves in refining and petrochemical plants all over the world. This growing demand is due in part to the rapid expansion of these two industries; but more important—Audco-Nordstrom valve design fits right into the picture.

Such features as a positive lubricant-sealed closure, easy operation with a quick quarter turn and long life make Audco-Nordstroms the best valve for virtually any refinery or petrochemical service.

Contact your Audco-Nordstrom representative for information on which Audco-Nordstrom valves are best suited to your services.

AUDCO and Nordstrom

BRITISH

AUDLEY ENGINEERING COMPANY, LTD.

Newport, Shropshire, England

OVERSEAS AGENTS located in South Africa, Australia, India, Trinidad, British West Africa, Finland, Norway, Sweden, France, Belgium, Switzerland, Italy, Spain and Portugal.

AMERICAN

ROCKWELL MANUFACTURING COMPANY

400 North Lexington Avenue
Pittsburgh 8, Pennsylvania

EXPORT: International Division, Rockwell Manufacturing Co., 7701 Empire State Building, New York 1, N. Y.

CANADIAN LICENSEES: Peacock Bros., Montreal, Quebec.

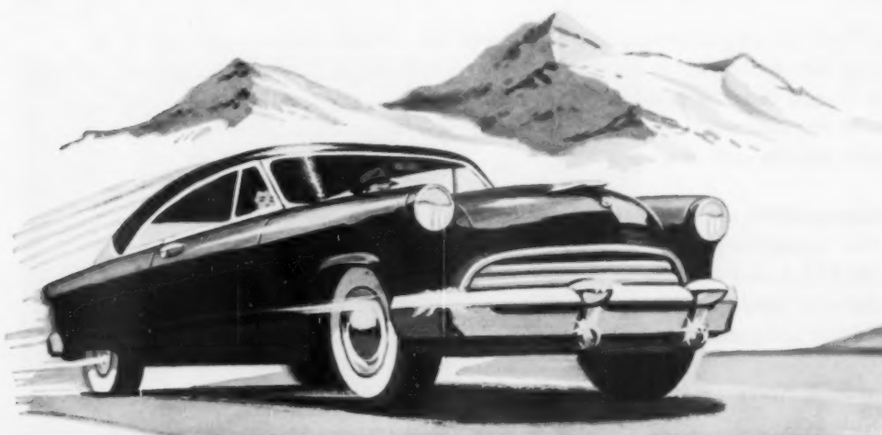
Seal in All Your Horsepower!

with the Veedol Motor Oil "Film of Protection"

Use all the horsepower built into your powerful engine! Seal *in* the great performance your car can give . . . with the world-famous VEEDOL "Film of Protection."

VEEDOL Motor Oil forms a protective anti-corrosion film on metal surfaces . . . helps keep soot, contaminants and gasoline out of your crankcase . . . fights the ravages of acid "engine sweat." So . . .

Don't waste horsepower! Use all the power your car can deliver. Change to VEEDOL Motor Oil . . . today!



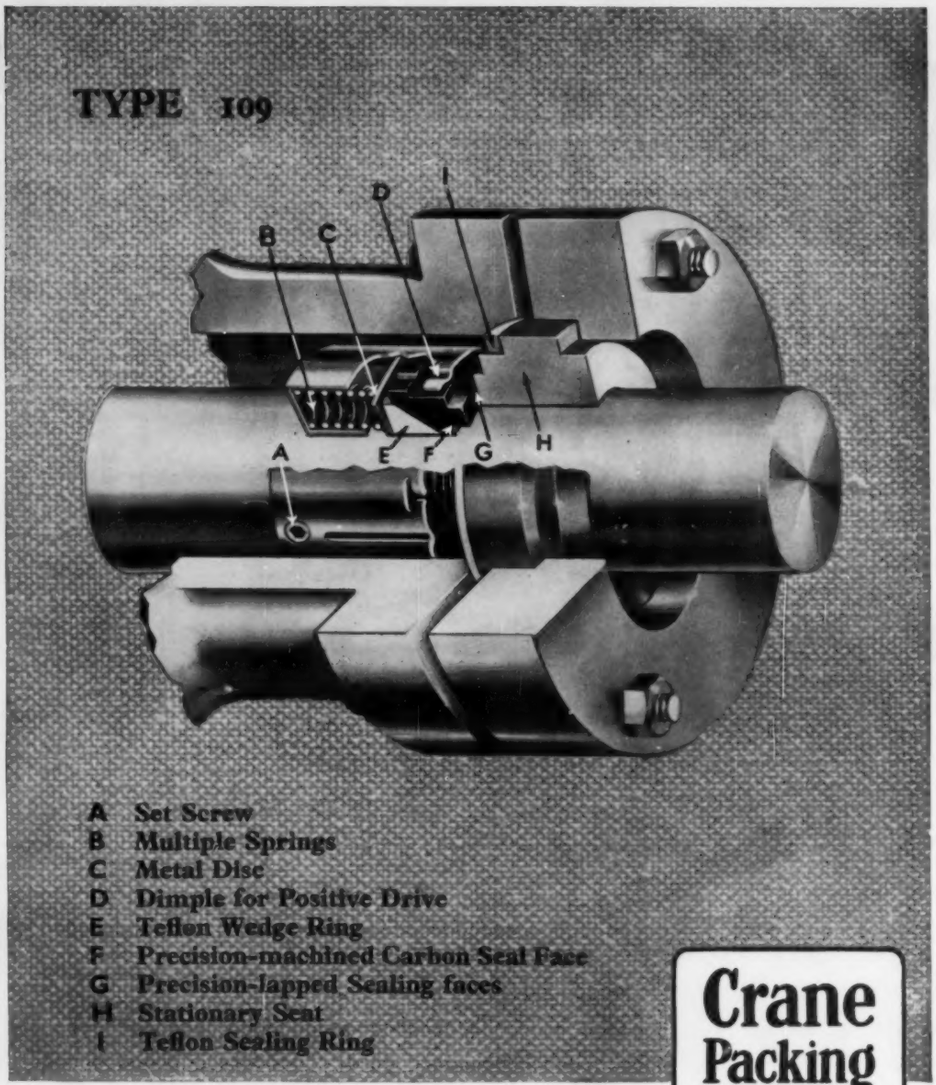
TYDOL

TIDE WATER ASSOCIATED OIL COMPANY
New York Tulsa San Francisco

FEDERAL TIRES
Federal Flying -A- Tires . . .
Good for a long safe ride!

© 1953 by Tide Water Associated Oil Co.

A Mechanical Shaft Seal



for High Temperature & Corrosive Services

Crane Packing LTD OF SLOUGH ENGLAND A COMPANY

This Type 109 Mechanical Shaft Seal will seal off corrosive fluids or gases which are being handled at temperatures up to 485° F. and at pressures up to 750 p.s.i. on such applications as centrifugal pumps, turbines, positive displacement pumps, agitators, etc. It is the first Seal of its kind to be manufactured in this country—it is precision engineered and corrosion resistant materials can be used for each component.

In order to impart to the assembly the required degree of flexibility a flexible wedge ring is used (see "E" on diagram). The new chemically inert polymerised plastic fluorethylene known as Teflon in the U.S.A. and as Fluon in this country, is the material from which this wedge ring is formed by means of special moulding and machining processes. All metal parts can be of stainless steel, or special alloys, depending on the nature of the service conditions.

Interested Engineers are invited to send for illustrated literature describing the Type 109 Mechanical Shaft Seal.

This is one of the many mechanical shaft seals which we manufacture for a wide range of services. We manufacture this design of seal by agreement with the Crane Packing Co. of Chicago, U.S.A.

CRANE PACKING LIMITED, SLOUGH, BUCKS.

AVONDALE

GEARED TO DO A BIG JOB WELL!

An example is the mammoth Derrick Barge, McDermott No. 7, built by AVONDALE for the J. Ray McDermott Co., Inc. Large capacity facilities for large capacity equipment.

AVONDALE . . . ready to serve the Petroleum Industry with ship and barge building and repairs, tank cleaning, steel fabrication and pipe-joint platforms for offshore drilling.

SHIP BUILDING • SHIP REPAIRING • FOUNDERS • PROPELLERS • STRUCTURAL STEEL

AVONDALE MARINE WAYS, INC.

CABLE ADDRESS "AVONWAYS"

P. O. BOX 1030 • PHONE UNiversity 4561 • NEW ORLEANS 8, U. S. A.

No Seat Leakage Through This Valve ...on Hot Wax Service, for instance

THE INSTALLATION

In the wax unit of a leading Gulf Coast lube oil plant, with Crane Steel Gate Valves in hot wax lines to slabbing machines.

VALVE SERVICE RATINGS

SUITABILITY:	Best for the job
FEATURES:	Outstanding Exelloy trim
MAINTENANCE COST:	Routine care only
SERVICE LIFE:	Good as new—after more than 2 yrs.
OPERATING RESULT:	No production lost to valve trouble
AVAILABILITY:	Regular Catalog item—No. 47X

THE CASE HISTORY

The steel valves originally installed here were hindering maximum wax production. The chilling cycle was slow—rejects for remelting were high. The trouble was that the shutoff valves were leaking, and hot wax was getting into the presses during the chilling cycle. Yet the valves were comparatively new.

There's been no such trouble since Crane No. 47X, 150-Pound Gates were installed more than 2 years ago. Their Crane Exelloy trim, suited for temperatures up to 1000 deg. F. keeps giving a tight shutoff on the hot wax, month after month, with easy operation. And they've done so with but routine attention, ever since installed. Better quality is always the bigger value, as every thrifty valve buyer knows.

THE VALVE

Workhorse of the petroleum industry—Crane 150-Pound Steel Gates—with exceptional performance assured by Crane quality design—Crane pioneering in steel casting—and the high adaptability of Crane Exelloy trim for most petroleum services. Sizes 2 to 24 in.; screwed, flanged, welding ends. See your Crane Catalog or your Crane Representative.

THE BETTER QUALITY... BIGGER VALUE LINE... IN BRASS, STEEL, IRON

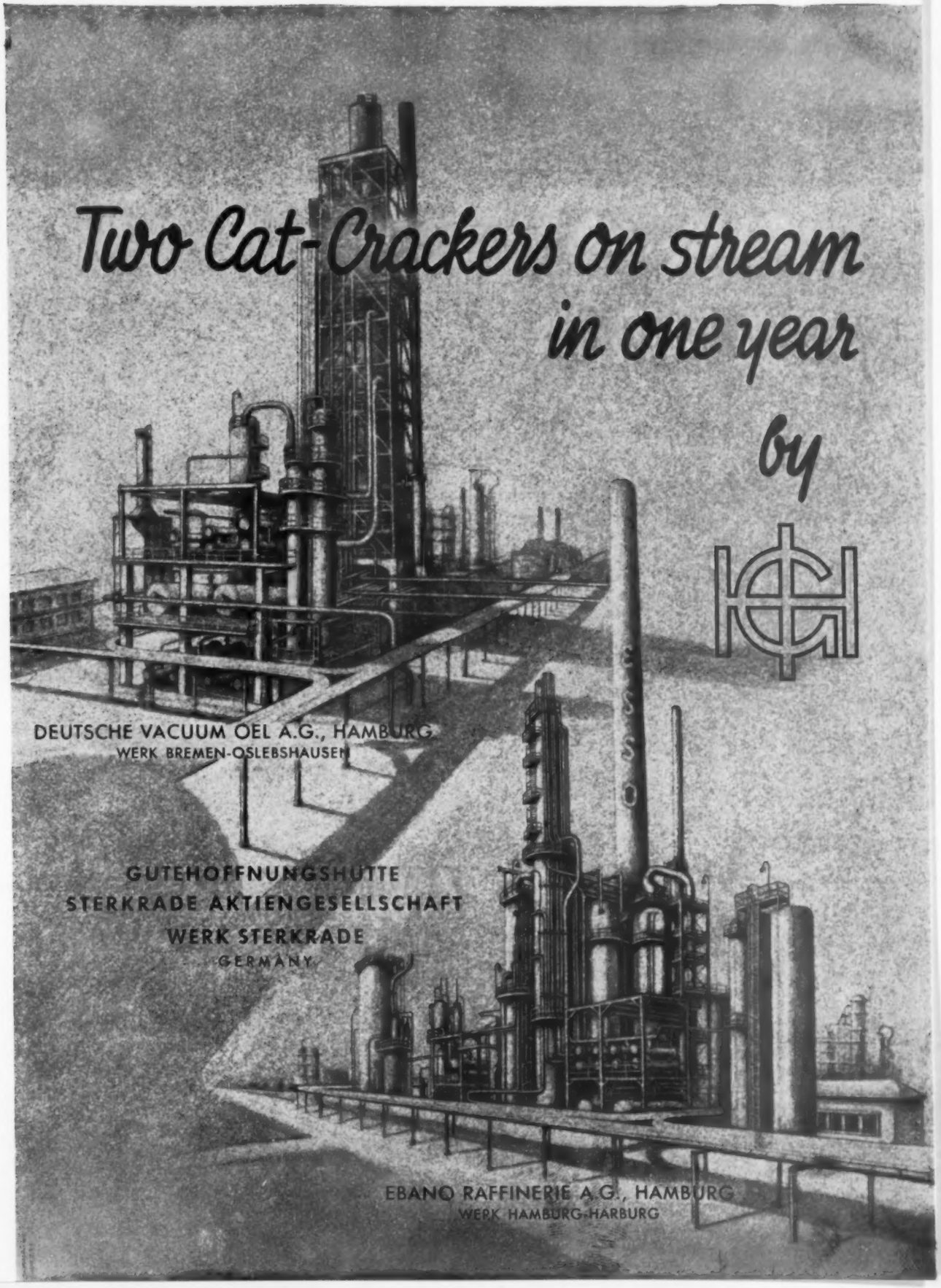
CRANE VALVES

Crane Co., General Offices: 836 S. Michigan Ave., Chicago 5, Illinois, U.S.A.

In Great Britain: Crane Ltd., 45-51 Leman St., London E.1, England

In Canada: Crane Limited, 1170 Beaver Hall Square, Montreal, Quebec

VALVES • FITTINGS • PIPE • PLUMBING • HEATING


Two Cat-Crackers on stream
in one year
by
DEUTSCHE VACUUM OEL A.G., HAMBURG
WERK BREMEN-OSLEBSHAUSEN
GUTEHOFFNUNGSHUTTE
STERKRADE AKTIENGESELLSCHAFT
WERK STERKRADE
GERMANY
EBANO RAFFINERIE A.G., HAMBURG
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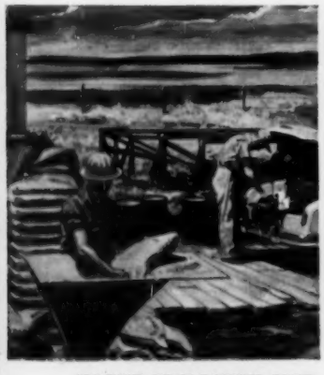
Security

IS ONE OF THE DRESSER INDUSTRIES

Security Engineering Division of Whittier, California, and Dallas, Texas, became one of the Dresser Industries in 1945. For more than two decades the name Security has meant top quality oil equipment embodying the finest in manufacturing skill and craftsmanship. In design, in engineering, and in performance, Security products are unsurpassed.



MAGNET COVE BARIUM CORP., Houston, Tex., Malvern, Ark. Magcobar drilling mud, Magcogel bentonite, Mylojel, Fiber Seal, Jel-Oil mud.

CLARK BROS. CO. DIVISION, Olean, New York. Engines and compressors—gas, steam and diesel driven.

DRESSER MANUFACTURING DIVISION, Bradford, Pa. Oil and gas pipe couplings, fittings and sleeves—rolled and welded rings—welded fittings and flanges.

KOBE, INC., DIVISION, Huntington Park, Calif. Complete hydraulic oil field pumping systems, including the Kobe Free Pump.

No. 5 in a series about Dresser Industries

What is the DRESSER plus+?

The Dresser Plus is the extra *service* you get when you deal with any Dresser company. It is an added advantage for you which stems from Dresser's unique overall organization. For Dresser is many companies with a single purpose—to provide the growing oil and gas industries with operating equipment that is *second to none.*

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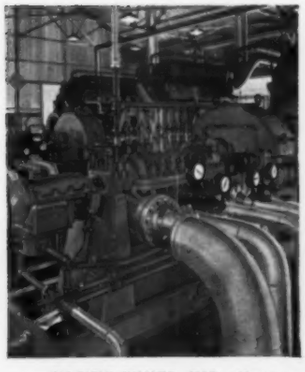
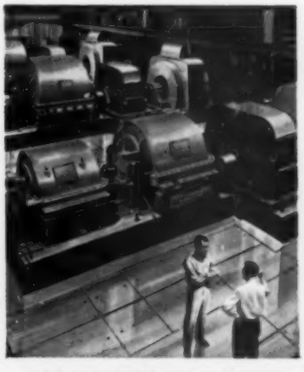


PACIFIC PUMPS, INC., Huntington Park, Calif. Centrifugal pumps, deep oilwell plunger pumps, hot oil and boiler feed pumps.



ROOTS-CONNERSVILLE BLOWER DIVISION, Connersville, Ind. Rotary positive blowers, gas pumps, centrifugal blowers, exhausters; positive displacement meters.

SECURITY ENGINEERING DIVISION, Whittier, Calif., Dallas, Tex. Rock bits, reamers, casing scrapers, reamer rock bits, coring bits, Securaloy.

IDECO DIVISION, Dallas, Beaumont, Tex. Derricks, drawworks, rambler drilling rigs, traveling blocks, rotary tables.

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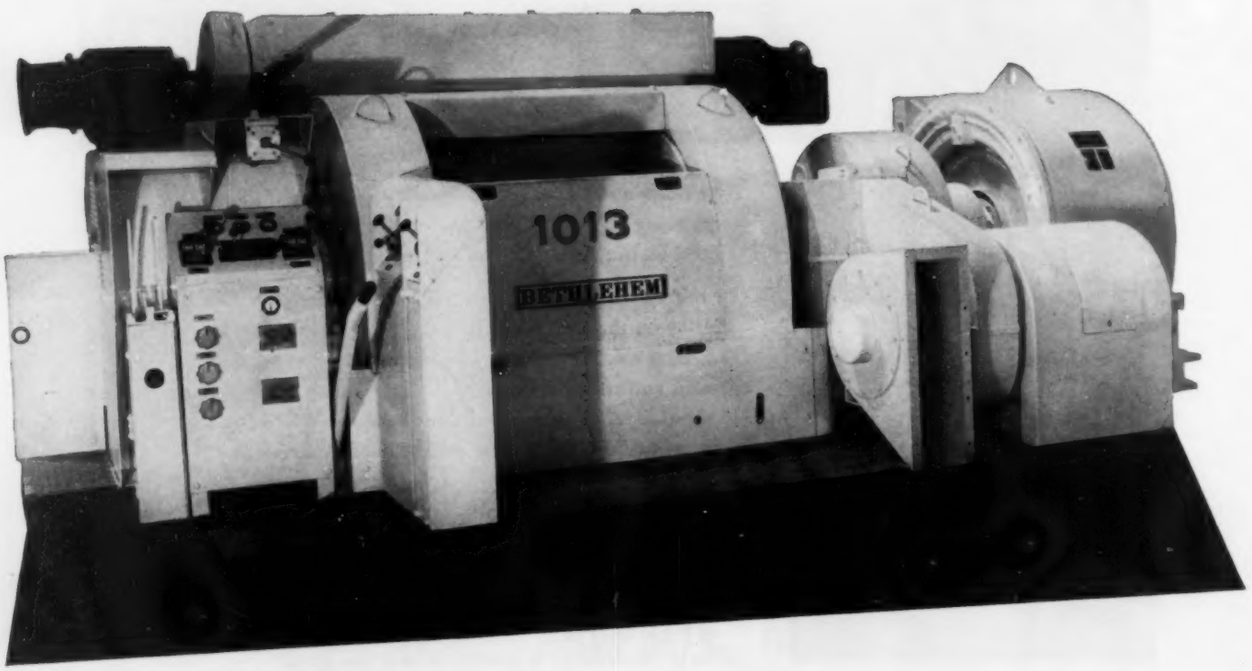

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A bright new era of industrial development is starting in the Pacific Northwest, now that the region has an assured supply of oil. Completion of the 718-mile Trans Mountain Oil Pipe Line is being implemented in British Columbia and Washington by the extensive construction of petroleum processing facilities.

Among the refineries which now or upon completion will have available Alberta crude oil from Trans Mountain or its U. S. lateral are:

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- General Petroleum Corporation, Socony-Vacuum's western affiliate, 35,000 barrels-per-day refinery at Ferndale.
- Shell Oil Company's 50,000 barrels-per-day refinery at Anacortes.

Bechtel has a key role in these programs—as designer, engineer and constructor of the refineries; and as owner's agent, engineer and manager of construction of the Trans Mountain Oil Pipe Line.

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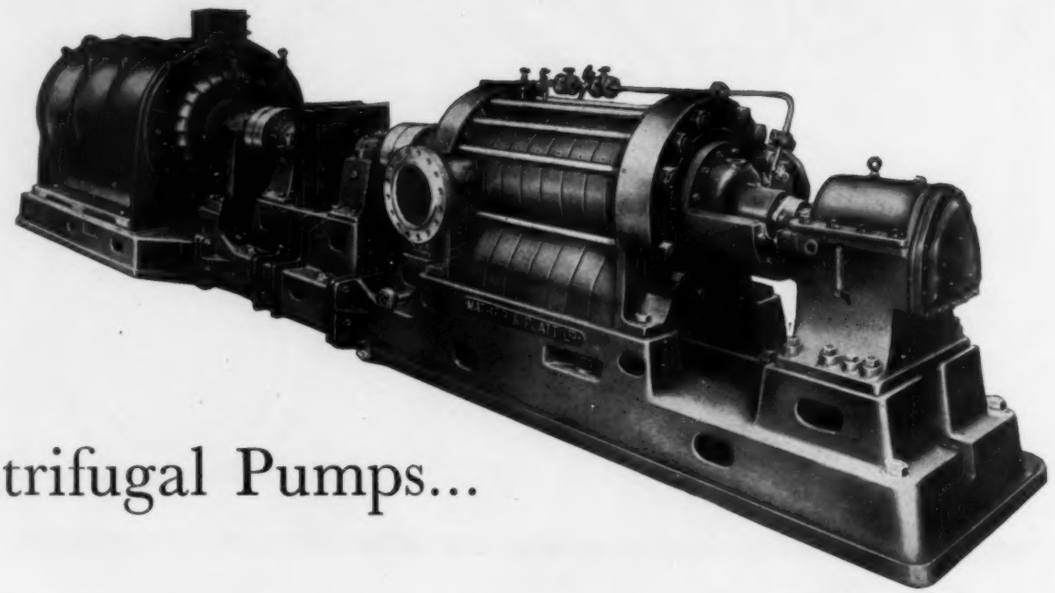

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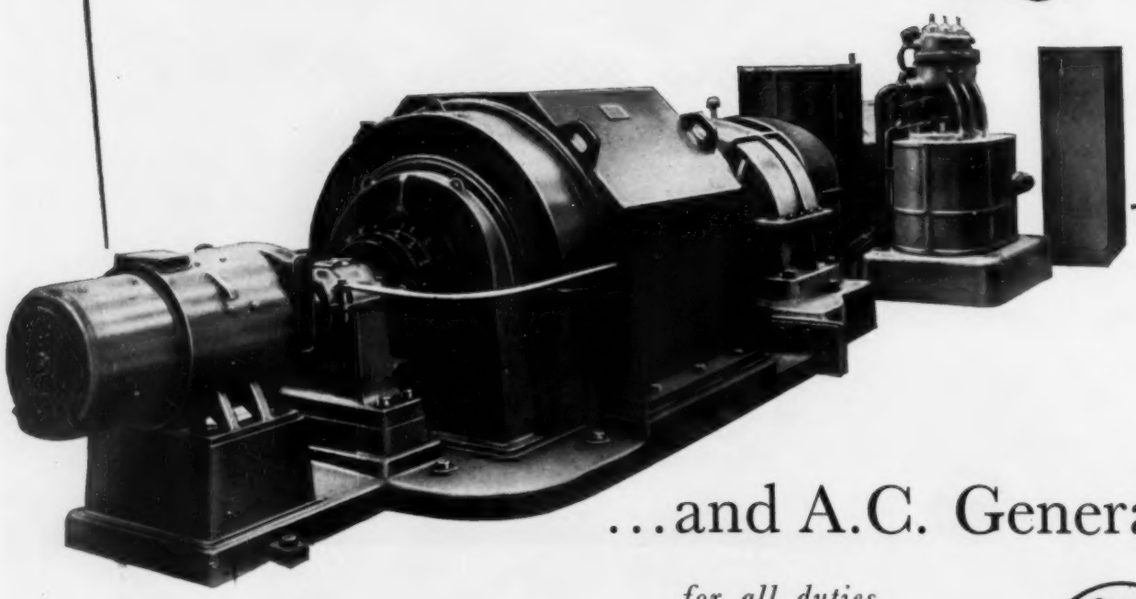

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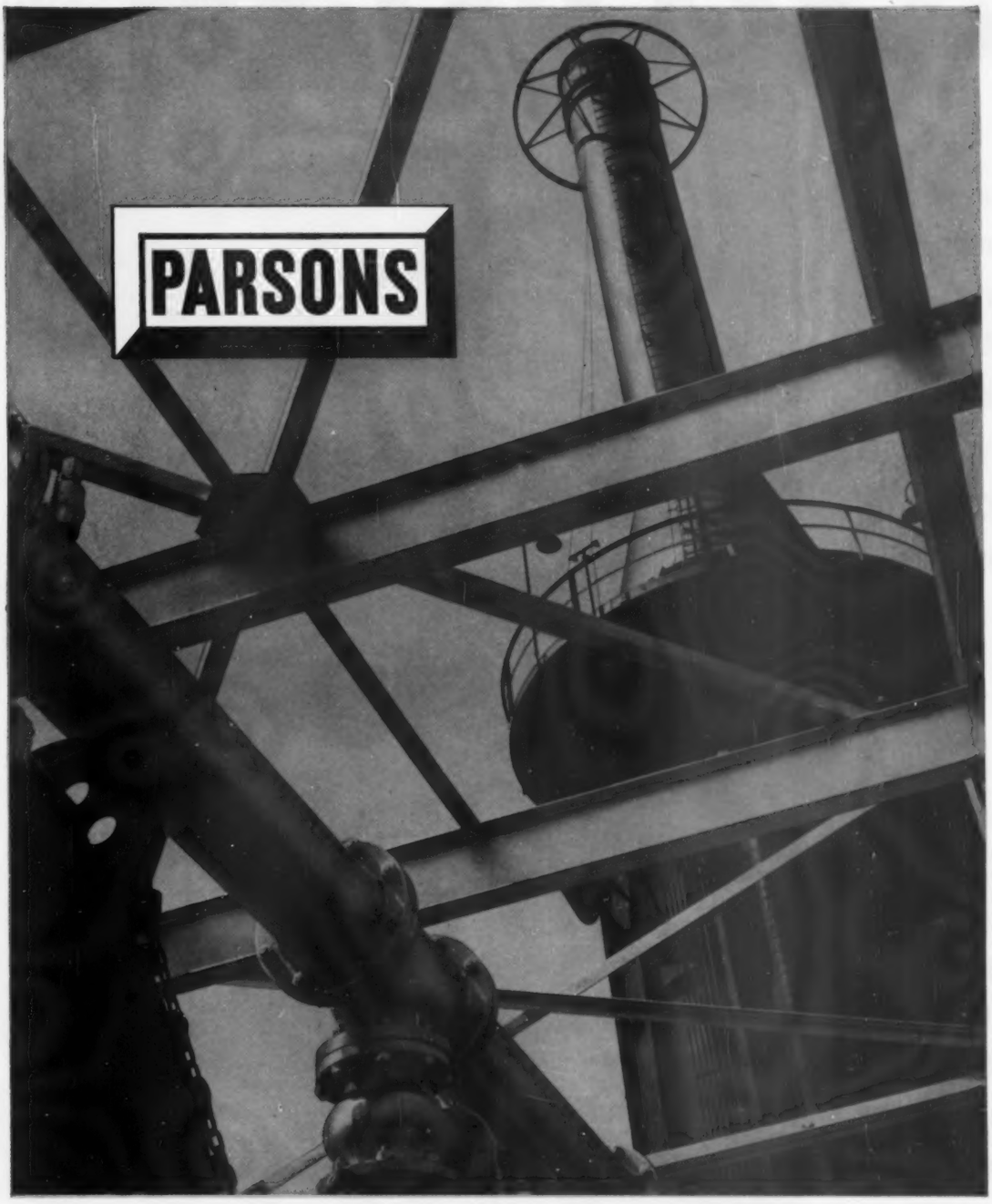

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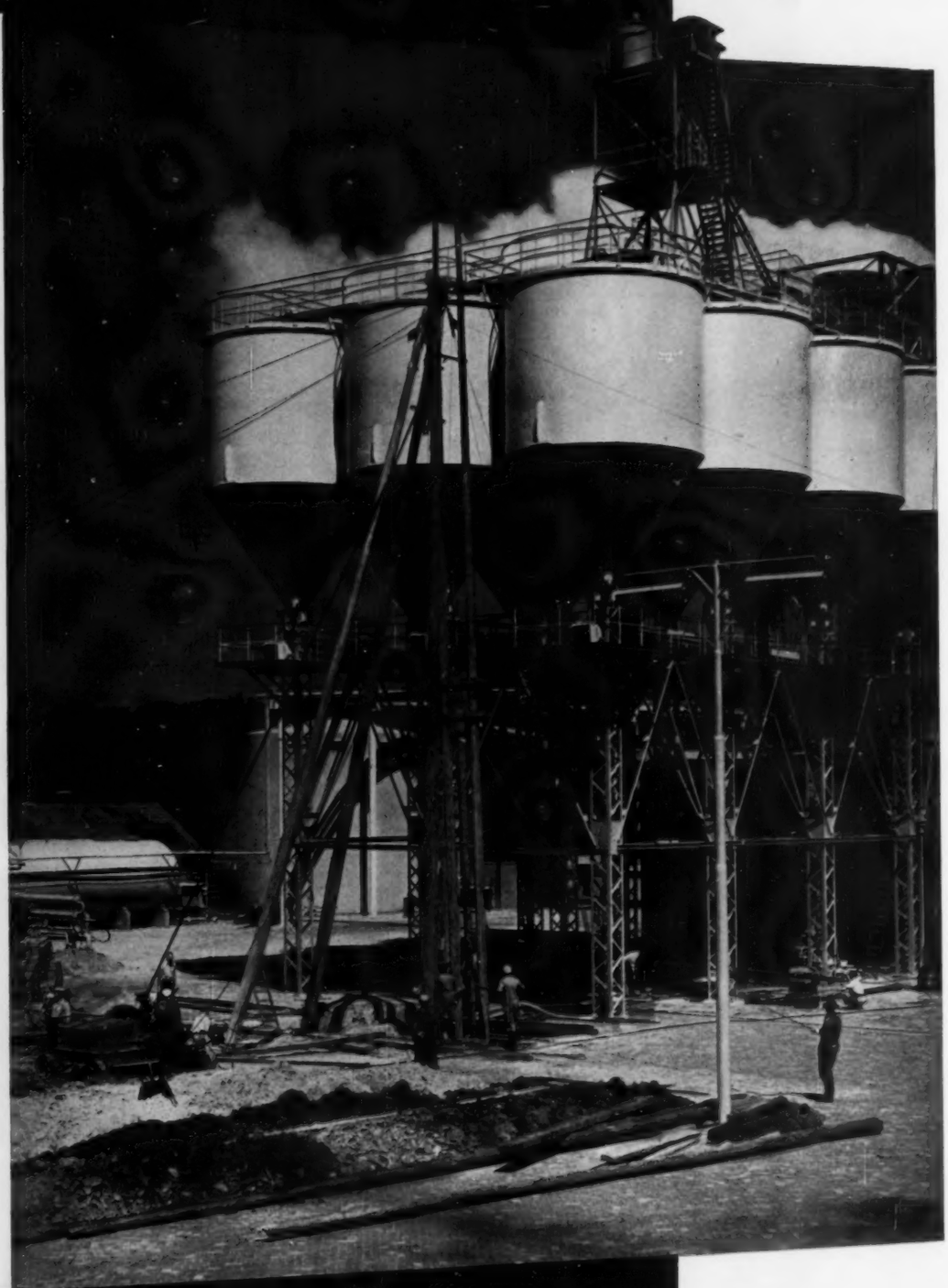

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The sand used in Stratafrac acts to prop and abrade the fractures, creating lenses of artificial permeability. The amount and size of sand used and the acid concentration of the Jel X 500 can be varied to fit formation characteristics.

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For more detailed information about Stratafrac and how it can help increase your oil production, contact your nearest Dowell station at your convenience. Or, write to Tulsa, Dept. C-48.

*U.S. PATENT NO. 2,354,570

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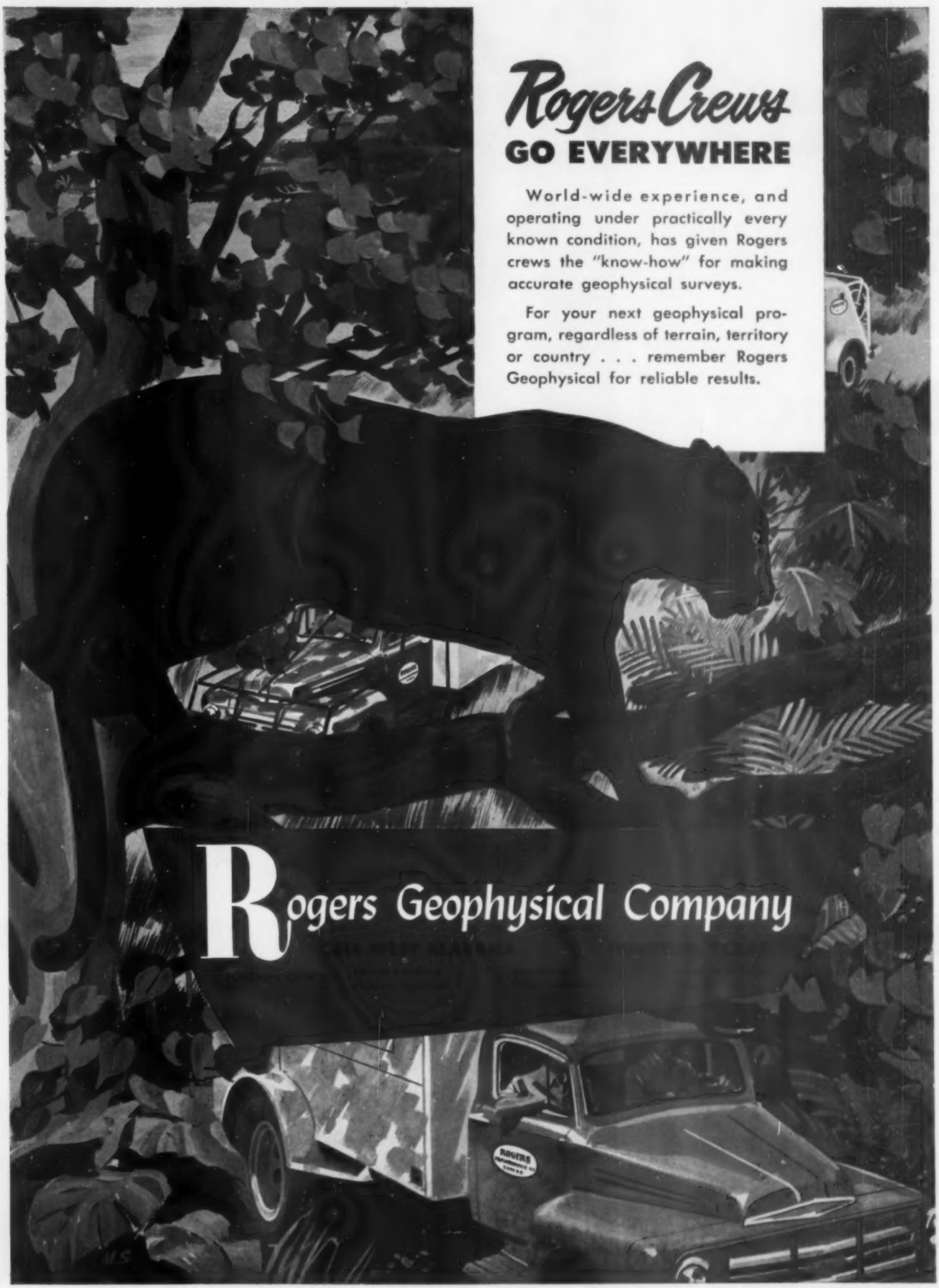
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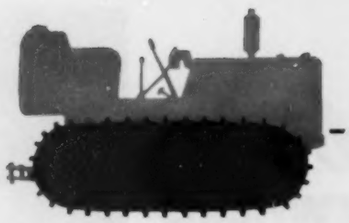

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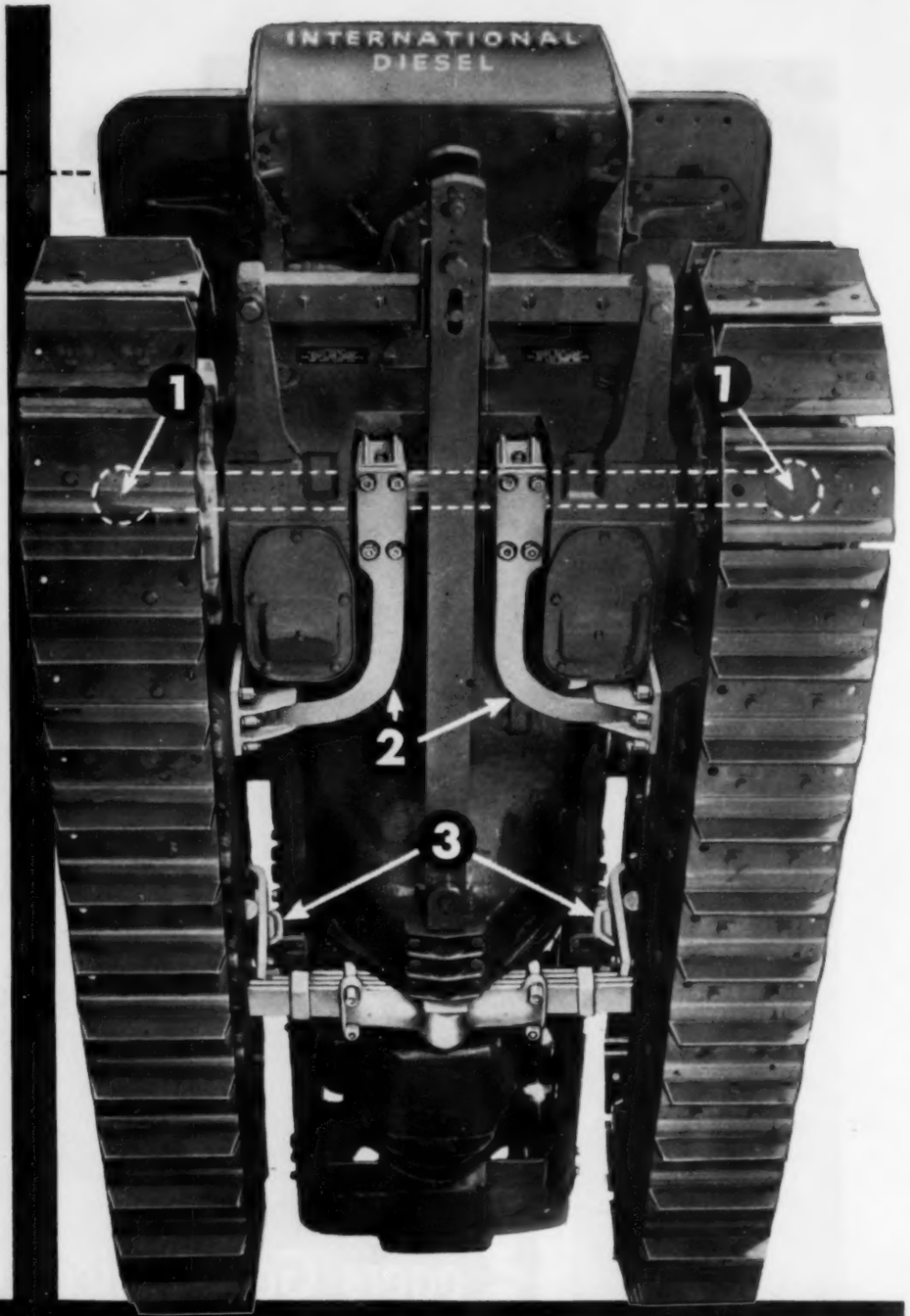

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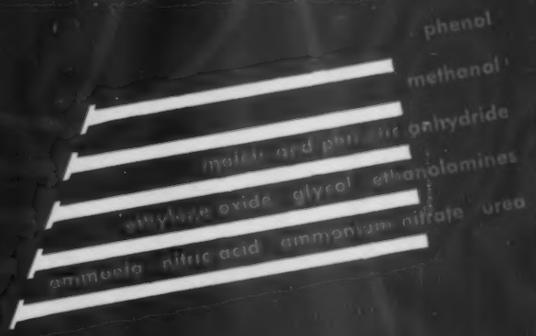
Leverage loads cannot cause track, final drive or pivot shaft misalignment . . . and that cuts maintenance problems and down time. Get all the facts on International Crawler Tractors from your International Industrial Power Distributor.

petrochemical processes



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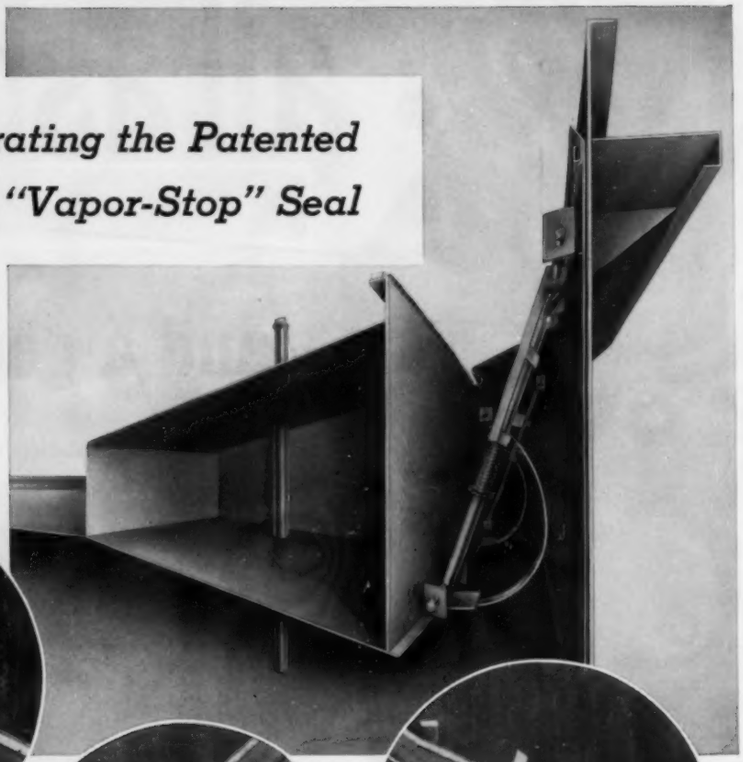
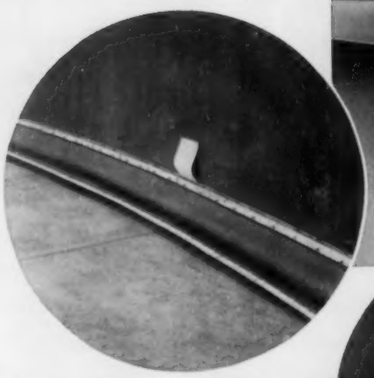
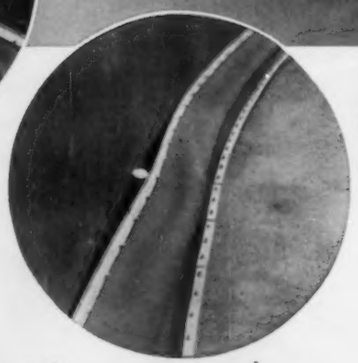
Demonstrating the Patented GRAVER *"Vapor-Stop" Seal*





it's tight! As seen above, the Graver "Vapor-Stop" Seal provides a firm closure between the roof and tank shell—so tight that a piece of paper will not slip through.



it's sensitive! Despite its effective closure, the sealing mechanism is so sensitive it does not break the egg shown above, indicating the friction-free, long-lasting performance that the seal provides.

it's flexible! The seal is free to move over obstructions, yet continues to close the gap and prevent loss of vapors. It is successful on both converted tank shells and new construction.

The seal mechanism is an integral part of all Graver Floating Roof designs, including the Double-Deck Floating Roof tank and the Center-Weighted Pontoon and Pan-type Floating Roof tanks.

This patented seal is the key to the successful functioning of Graver Floating Roof tanks. Composed of two mechanisms—a weighted arcuate pusher and a spring-actuated hanger, it acts as a "Vapor-Stop," preventing loss of volatile vapors. The seal provides positive centering action for the roof. It also prevents the entrance of air and rain, and resists corrosion.

Simple and foolproof, it eliminates the need for multiple seals. The mechanisms are completely covered, and the fabric is asbestos coated with Neoprene, impervious to vapors. Graver's "Vapor-Stop" Seal is fire-resistant and Underwriters' Laboratories approved.

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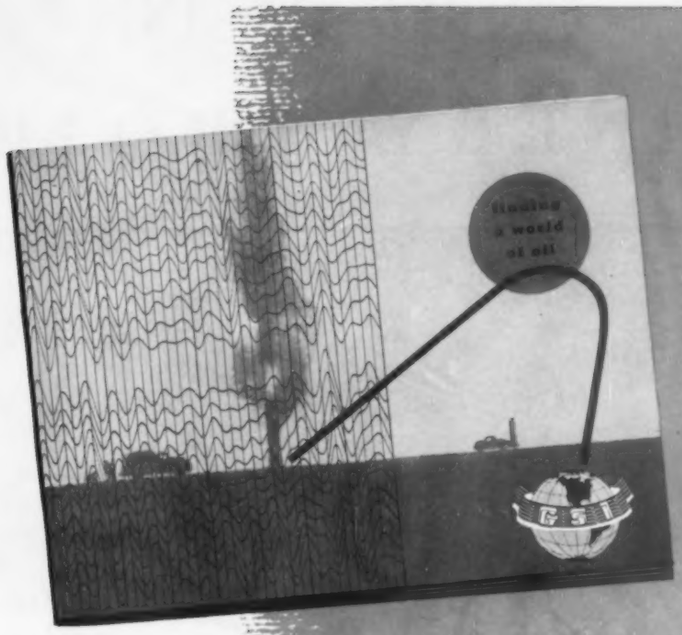

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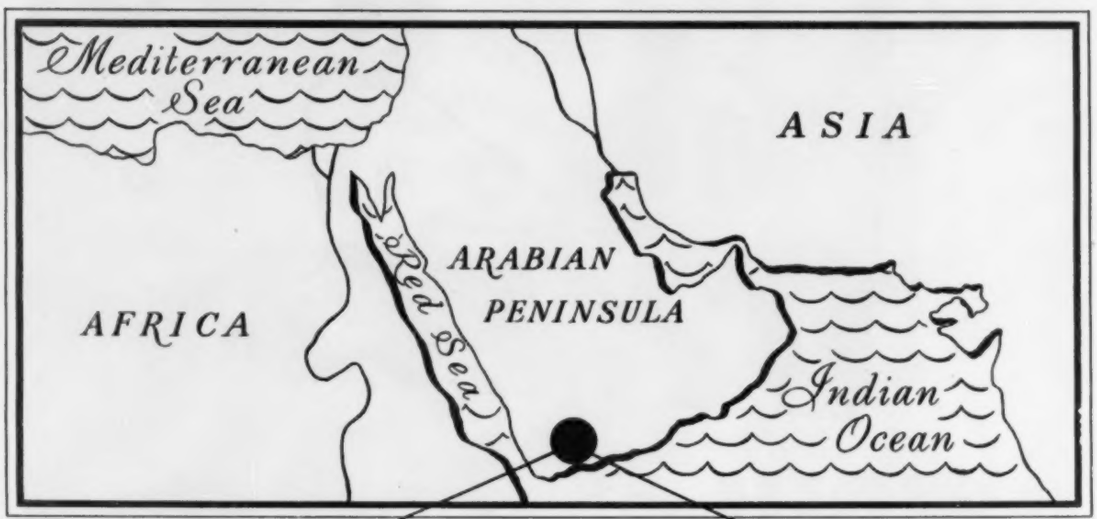

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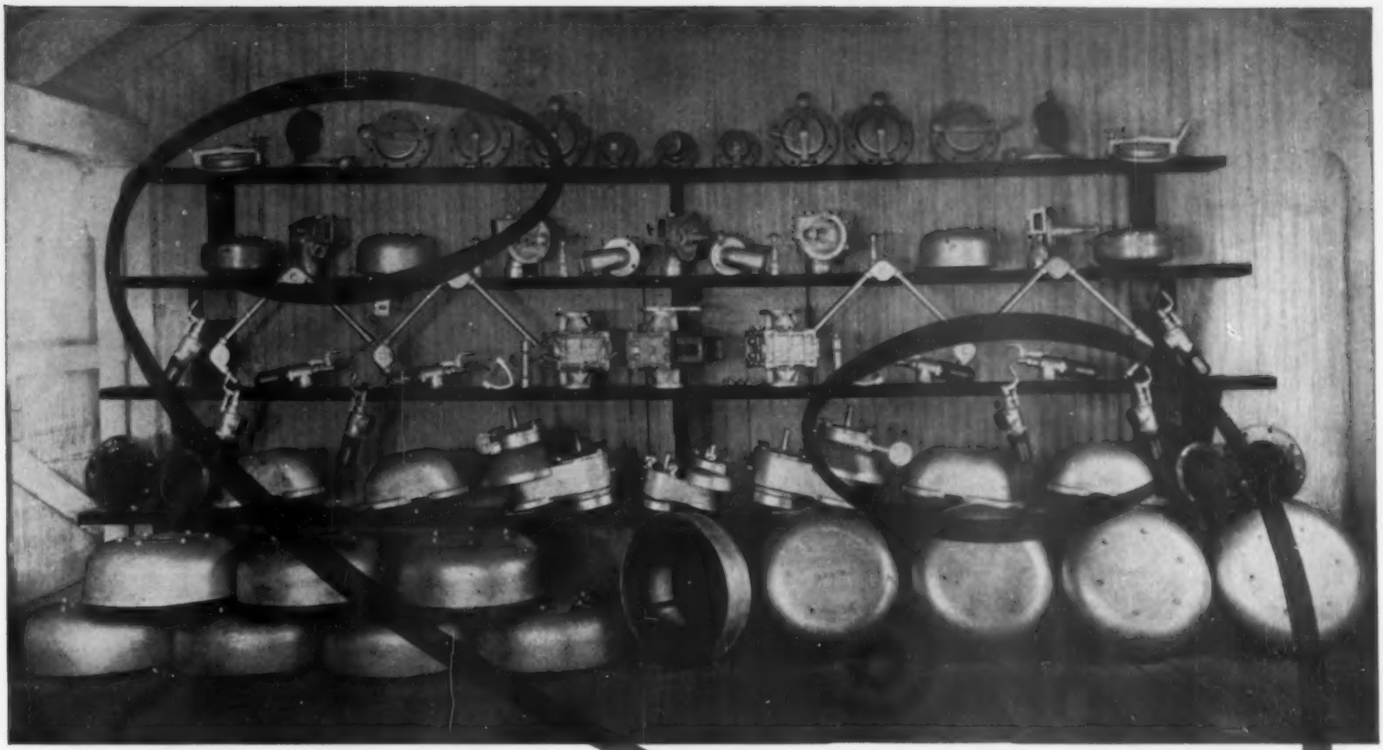

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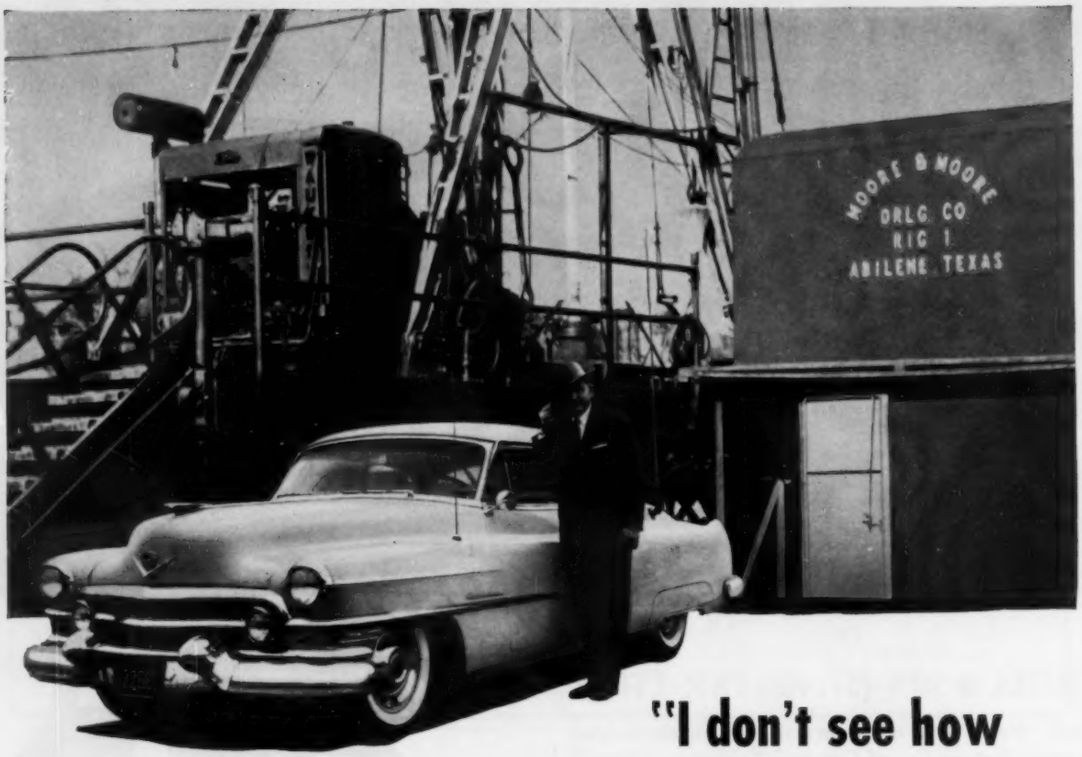

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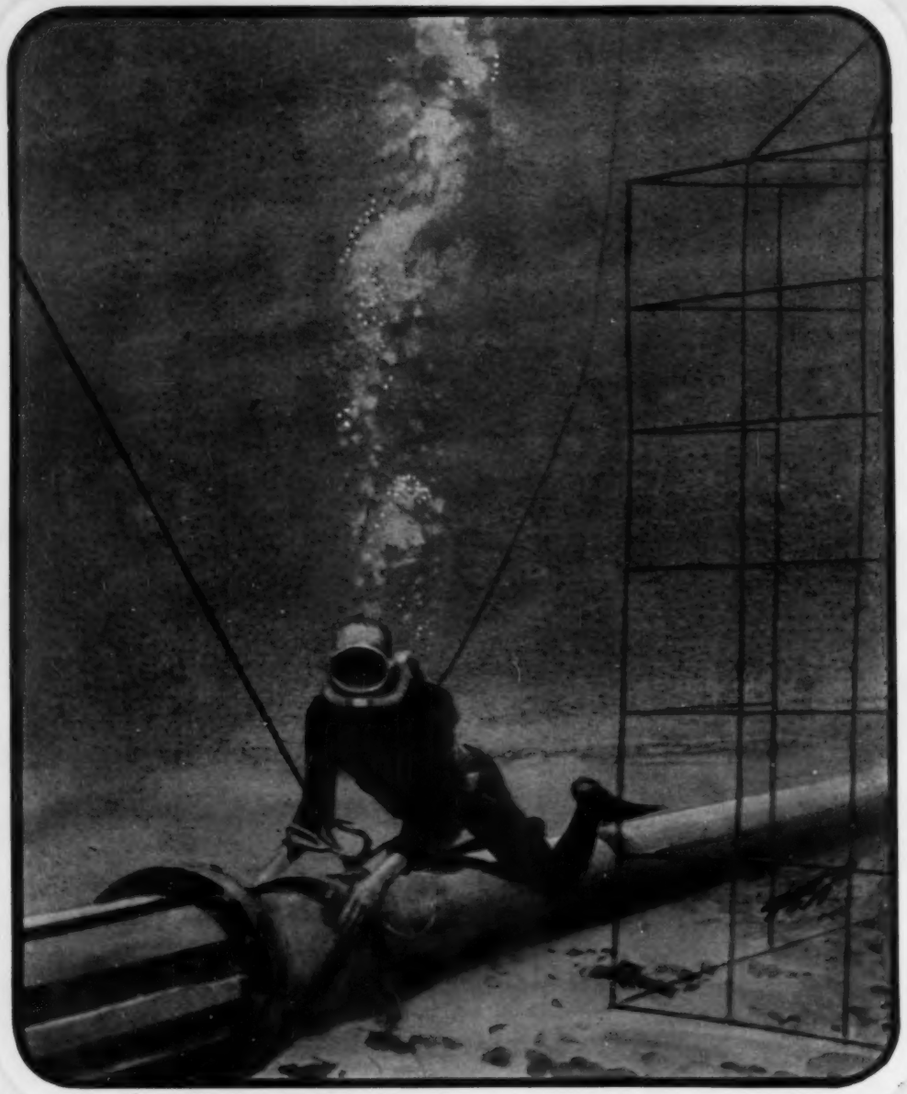

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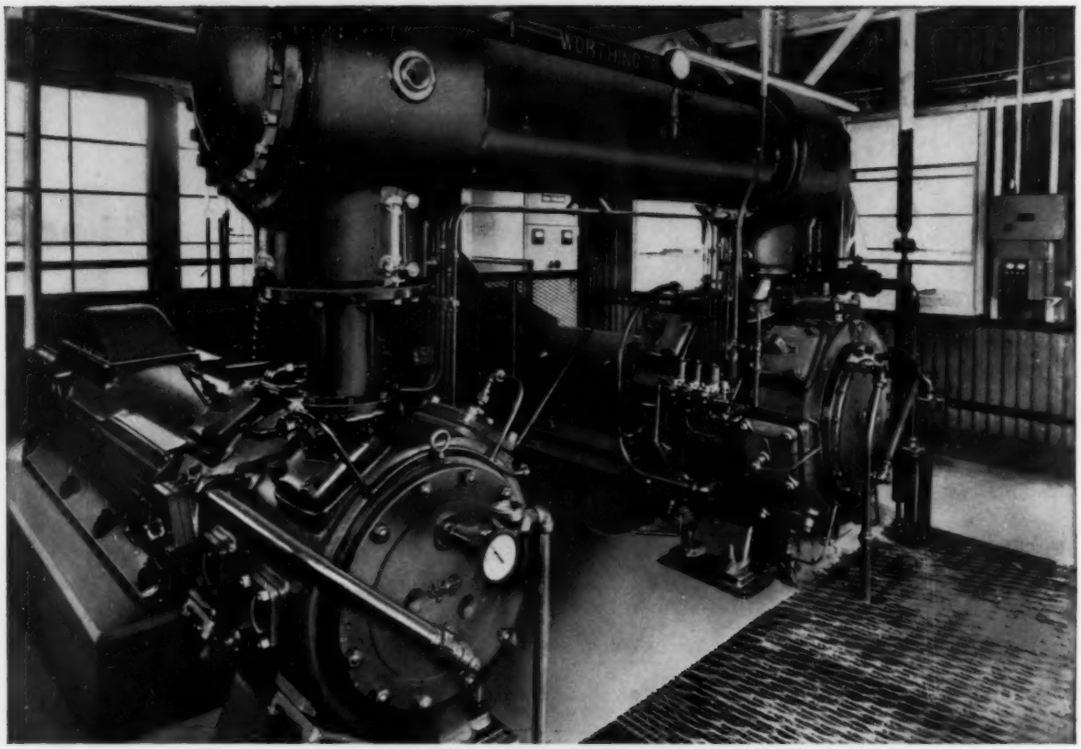

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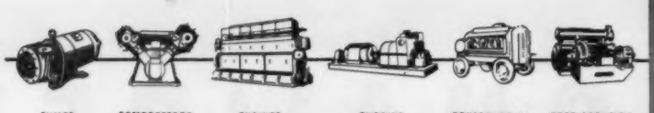

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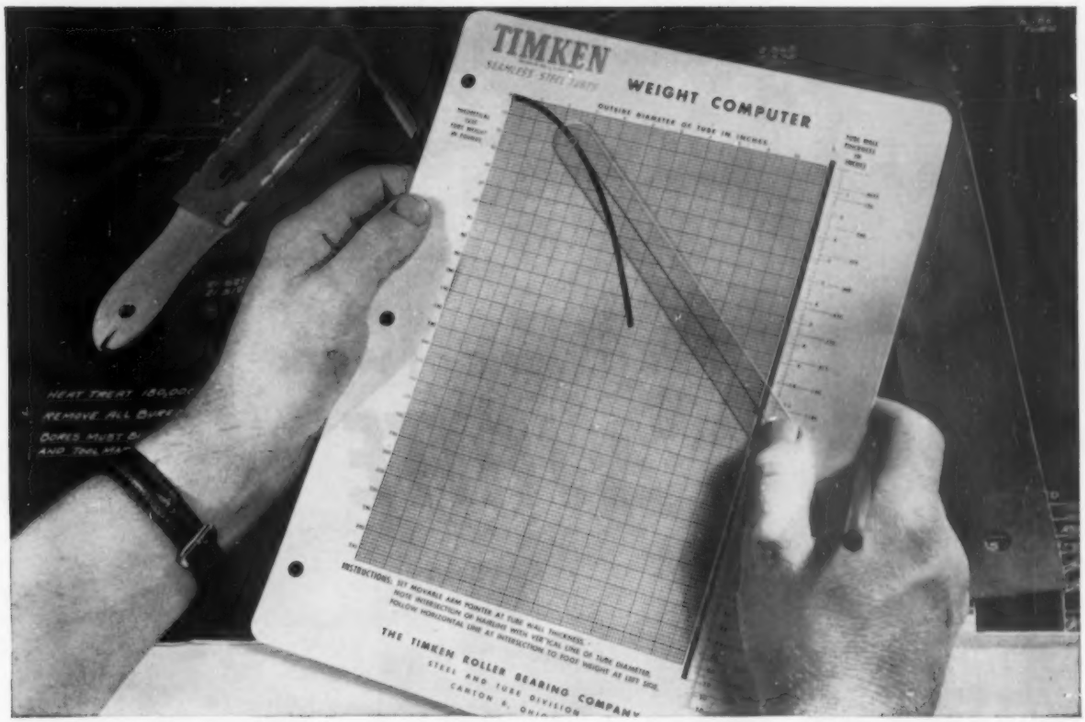

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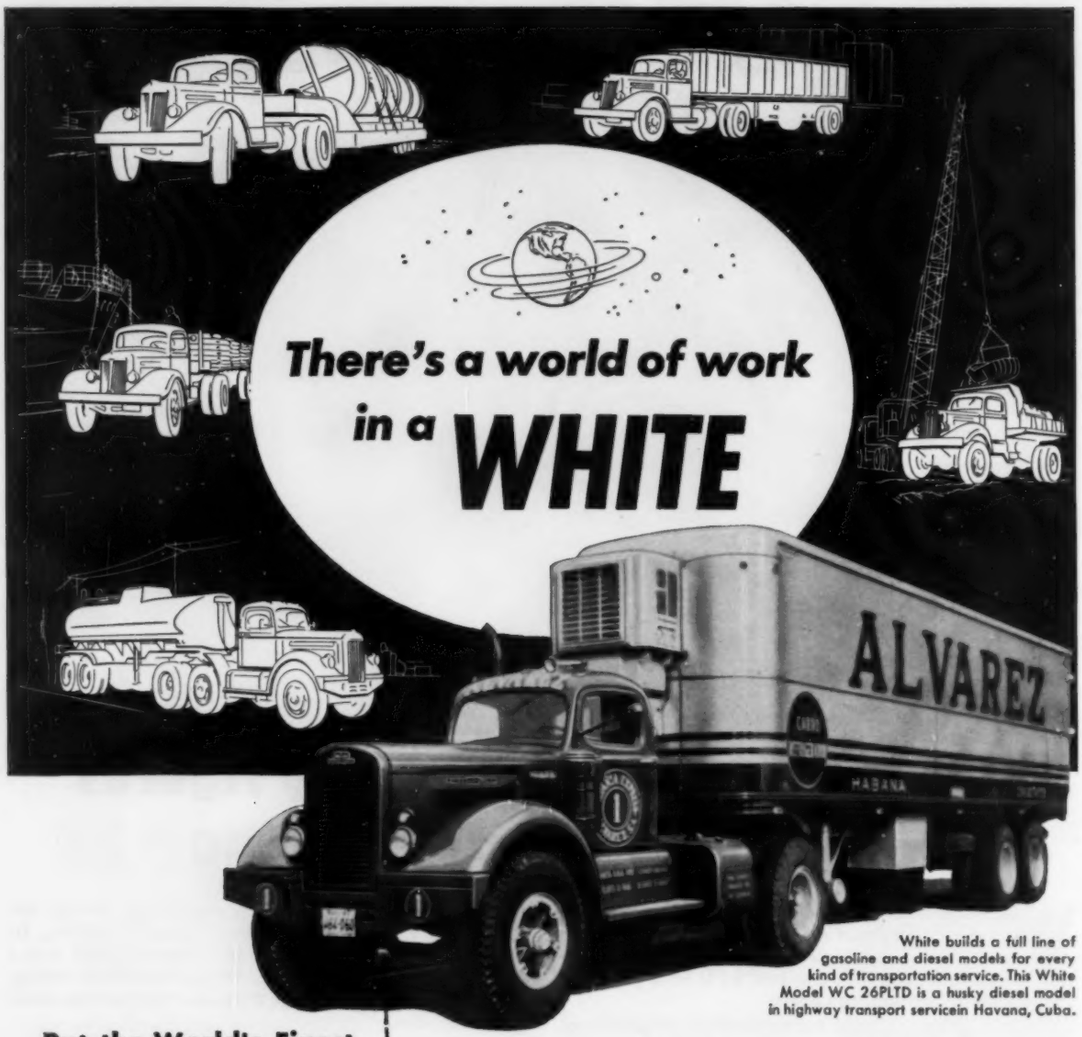

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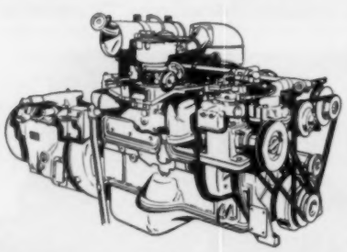

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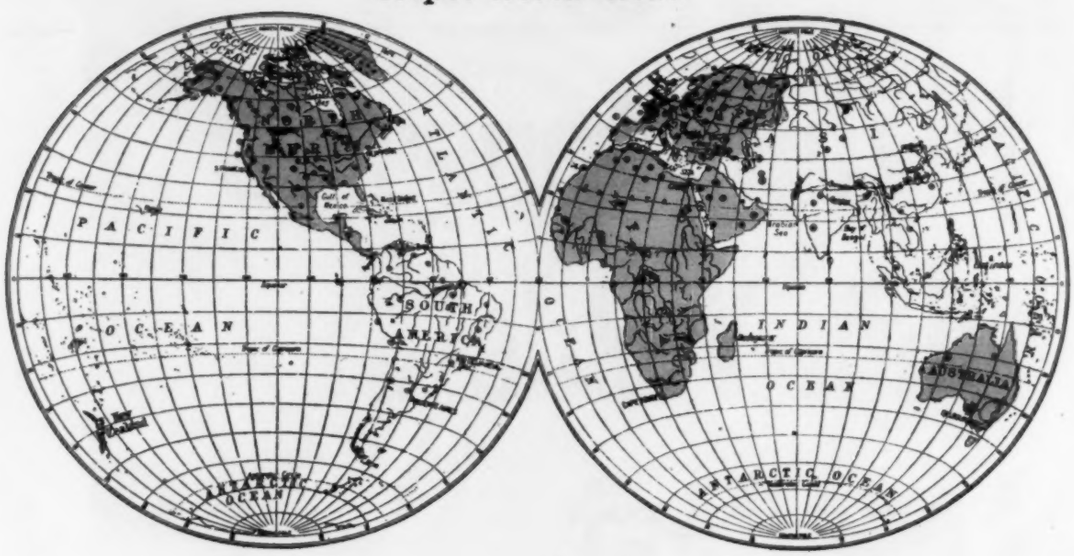

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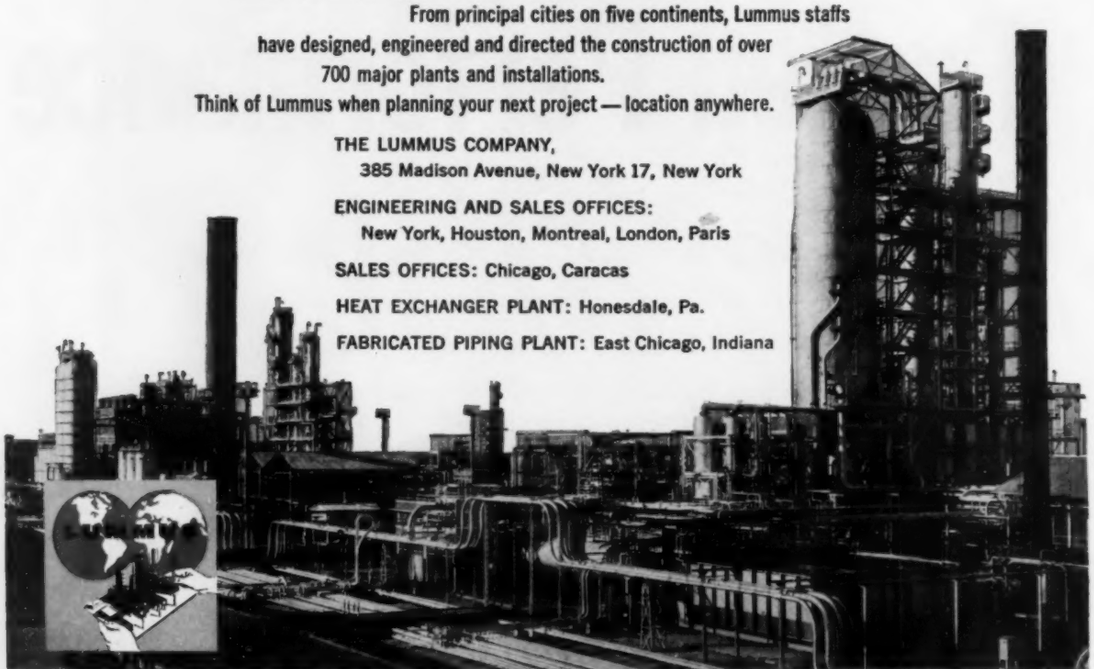

ILLUSTRATED: 40,000 B/D petroleum refinery at Dunkirk, France, designed, engineered and constructed by Lummus for the Societe Generale des Huiles de Petrol

VOL. 25, NO. 3, MARCH 1954

World Petroleum

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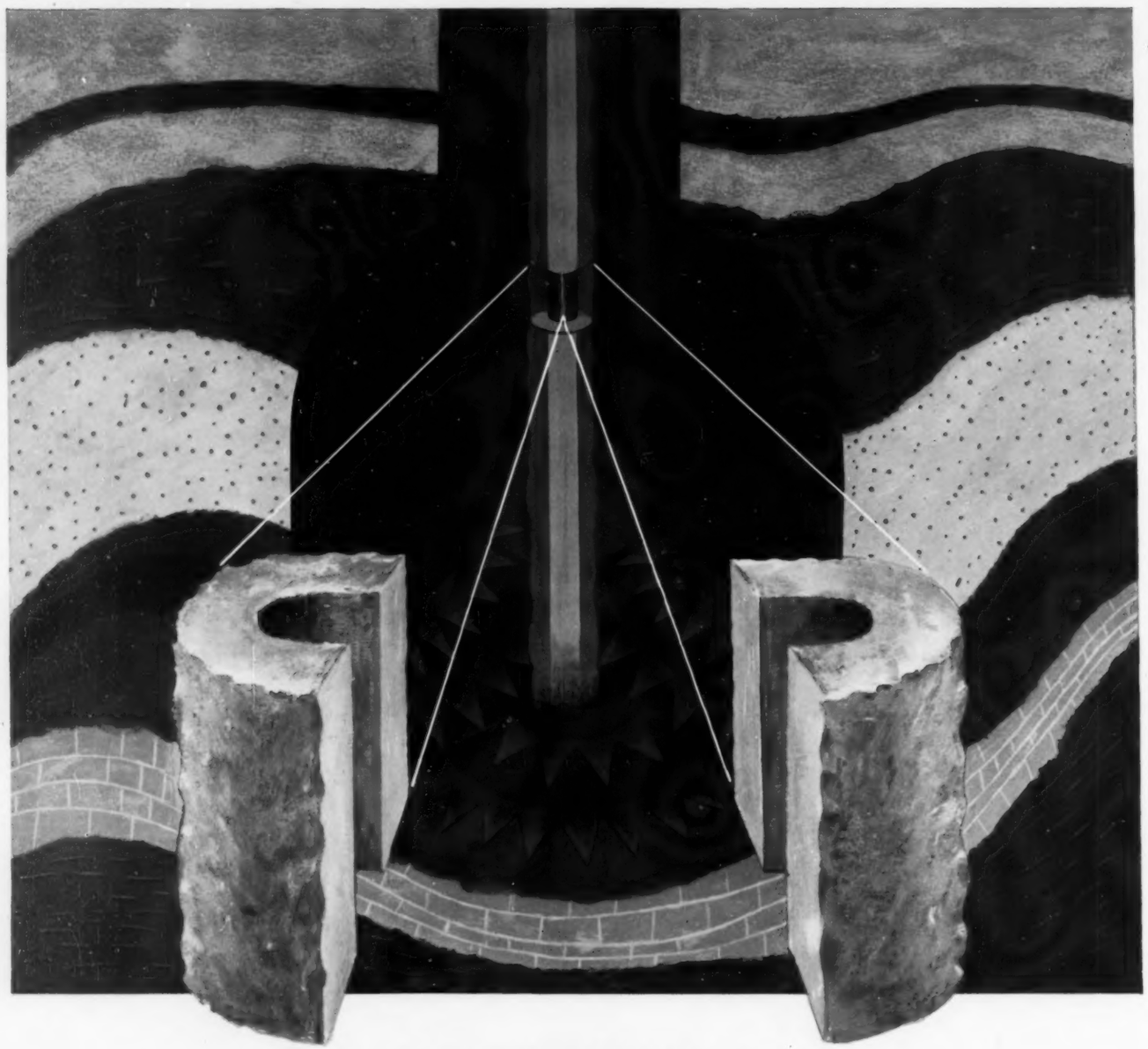
THIS MONTH'S COVER

Double rig erected on a platform offshore in the Gulf of Mexico by The California Company, a subsidiary of the Standard Oil Co. of California. Two wells can be drilled simultaneously from this platform and ten can be completed by resorting to directional drilling. Color photograph is by Leon Trice, New Orleans. Plates are reproduced through the courtesy of C. R. Lyman, editor of the Standard Oil *Bulletin*.



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EXPLORATION ACTIVITY TO EXPAND IN 1954

TALK OF OVERPRODUCTION in the world oil industry and estimates that two million barrels of potential daily production are now shut in are having no visible effect in slowing down the search for new sources of supply. Advance reports from oil companies in the United States indicate that while there may be some slight slackening of development drilling during 1954 in certain areas as compared with the year just ended, the number of wildcat wells will show a substantial increase. A conservative estimate places the probable gain at 10 to 12 percent. If comparison were made on actual footage, the rise would be even more striking since the average depth of wells increases yearly.

In this connection it is interesting to note that while the number of exploratory wells drilled has risen steadily during the past three years, the percentages of productive wells and dry holes have remained fairly constant. Thus, while the capital investment per well grows greater from year to year, the volume of new liquids added to reserve continues to increase as well.

In other parts of the world, exploratory effort is headed for a record high during the coming year. Certainly the range of activity will be broader than ever before. In Canada the expansion of transportation facilities, including oil and gas pipe lines spanning the continent, has given renewed impetus to exploratory and development drilling hitherto held back by inability to move more production.

Elsewhere in the Western Hemisphere special conditions have encouraged increased activity in the search for oil. In Mexico the rapid growth in consumption has made necessary a campaign to enlarge indigenous supplies of oil and gas. In Peru a progressive petroleum law has led a number of international companies to acquire concessions which will require extensive surveys and test drilling. It is noteworthy that in Venezuela, leading oil producer of South America, wildcat drilling increased nearly 30 percent in the past year. Other countries in the southern continent are moving to encourage greater activity and to enlist outside capital in oil development.

It is in the Eastern Hemisphere, however, that the most widespread movement to expand the search for new sources of power and energy is under way. This is due in part to the fact that the demand for petroleum products is rising at a more rapid rate there than elsewhere, and in part to changes resulting from World War II which makes reliance upon liquid sources of energy more necessary. The movement toward the exploration of large untested areas has been under way for the past several years, and in a number of these districts preliminary geological and geophysical studies have advanced to the stage where the test of the drill can be applied.

During the past few months some noteworthy discoveries have been made. Perhaps the most spectacular was in Western Australia. The well, first to be drilled on a large concession near Exmouth Gulf, north of Perth, found oil in sands at a depth of 3,500 feet, but is being carried further down to check underlying formations.

Other developments to which significance is attached were the finding of oil showings in the course of exploratory drilling in Sicily, in Nigeria and at various points in the Middle and Far East. Some of these may lead to the development of successful fields while others will be disappointing. The one conclusion to be drawn from all these efforts is that the search for oil is being pursued with growing intensity from year to year, based on the sound belief that the world's need for petroleum is far from being satisfied.

A notable feature of projected exploration for 1954 is the attention directed to submarine work. With the settlement of the tidelands controversy, a renewal of activity in marine offshore drilling in the Gulf of Mexico and on the Pacific coast was to be expected, but increased attention also is being directed to marine operations in many other parts of the world. Offshore drilling is projected for the shallow waters surrounding Qatar. An underwater survey of other portions of the Persian Gulf has been undertaken by D'Arcy Exploration Co., Anglo-Iranian subsidiary. Marine tests also are under way or projected in Borneo, in Trinidad, in Peru, and in the North Sea off the coasts of Germany and the Netherlands.

Exploration growth is world-wide

ADVANCE REPORTS from oil companies in the United States point to a normal increase in development drilling during 1954 and a proportionately larger gain in wildcatting. As the total number of wells of all kinds drilled in 1953 was close to 49,000, this expectation, if realized, will carry total drilling in 1954 to nearly 52,000. Wildcats, numbering some 11,000 in 1953, may reach 12,000 in the coming year.

While opinions vary as to the rate of increase to be anticipated, agreement is uniform that demand for petroleum products will continue to rise during the coming year and that increased exploratory effort will be needed to maintain adequate reserves in the years ahead.

The same trend toward intensification of exploratory activity is apparent in advices from other parts of the Western Hemisphere. Special reports covering Canada, Venezuela and Peru on other pages of this issue indicate the expanding activity in exploration and the same tendency is revealed in reports from Mexico, Colombia, Argentina and other countries of the southern continent.

In the Eastern Hemisphere, oil production in 1953 increased over the year preceding by between 13 and 14 percent. Of the total output of slightly over four million barrels daily, approximately two million or almost half came from Middle East fields. Of these Middle East areas, Kuwait and Saudi Arabia continue to lead in output, though the greatest gain in production during the past year was made by the Iraq Petroleum group of companies, due largely to the expansion of their pipe line facilities. While all these companies have potentialities for enlarging production as demand may warrant, they all are extending exploration to test new areas and to gain information regarding reserves.

Kuwait's main source of production is still the prolific Burgan field, but during the past two years drilling has been extended to the nearby Magwa area where several producing wells have been brought in. Three exploration rigs are now at work in the Magwa - Ahmadi districts. Two seismic parties are engaged in surveys near Jahra and Minagish, inland and to the north and west of existing production. An examination also has been made of Bulyan Island, offshore from northern Kuwait, but it is reported as offering little indication of the presence of oil.

Iraq Petroleum Company drilled 14,951 feet in 1953, about 10 percent less than in the preceding year. It completed six wells, four exploration and two development. The most considerable discovery was the Bai Hassan well, located close to the Lower Zab on the southern side of the Zab bridge. Exploratory drilling was continued at Kor Mor and also at Palkanah and Chemchemal. The company's production of roundly 45,000 barrels daily was mainly supplied by 44 wells.

Basrah Petroleum Company, a member of the Iraq group, drilled 12 new wells during 1953. The most important discovery was an exploratory well at Rumalia, 20 miles west of Zubair. The extent of the field has not been determined, but conditions are said to be similar to those at Zubair.

Mosul Petroleum Company drilled 21,525 feet during the year and completed two wells, bringing the number of its producers at the end of the year to five, four at Ain Zalah and one at Butmah. In Qatar, which produced its ten millionth ton of oil on September 1, the footage drilled during the past year was 50,835. Eight wells were completed, bringing the number of producers up to 22. Two wells were in process of drilling at the end of the year.

Elsewhere in the Persian Gulf area exploratory drilling has been going on in the Trucial Coast region and oil was found in a well at Murban at a depth of about 10,000 feet. Testing of this well is in progress.

An offshore survey is being conducted by D'Arcy Exploration Co., which holds a concession to explore 12,000 square miles off the coast of Abu Dhabi. At the request of Anglo-Iranian, parent company of D'Arcy, Commandant, J. Y. Cousteau, noted undersea explorer, is carrying on submarine research in this concession while a gravimetric survey is also being undertaken.

Anglo-Iranian and Compagnie Francaise des Petroles hold a concession of 13,000 square miles on the continental shelf subject to the Ruler of Dubai. Plans for development are under way. Shell has started exploration of its offshore concession at Qatar and has a seismic survey party at work in that location. An option on a concession of 30,000 square miles in the province of Dhofar in the Sultanate of Muscat and Owan is held by American interests and a preliminary geological examination has been made.

Further east, Pakistan Oil Fields (Pakistan subsidiary of Attock Oil Co.) has been delayed in a redrilling job on its second test well at Bains, but indications are that the limestone is very deep in this location and considerably more drilling is likely to be required before the well's prospects can be determined. Structure tests drilled in the Karsal are sufficiently favorable to warrant the drilling of a deep test which may go down 11,000 feet. Pakistan Petroleums Ltd. is continuing to drill in the Balkassar field in the West Punjab. Fissuring in the Eocene is irregularly distributed and wells have given varying results.

Drilling for Burmah Oil Co. at Sui in the Bugti hills district of Baluchistan has confirmed the presence of a gas field of some importance and plans are under way for production and distribution of the gas. A test well is being drilled at Zin, not far from Sui, and preparations are being made for a seismic survey of the alluvial region to the southwest.

Exploratory drilling by Assam Oil Co. at Nahor Katiya, near Digboi in India, has found four oil sands at depth. Further tests will be required to determine the extent of the field, but it is expected to be a useful addition to the reserves of the company. A program of geophysical exploration has been started including an air-borne magnetometer survey, gravity and seismic reflection work. Exploratory drilling has continued west from Digboi, but at Nichuguard, 140 miles to the southwest, a test well has been abandoned as a failure.

Production from a new horizon in the Dhulian field of Attock Oil Co. is reported as satisfactory. A flank well being drilled is at 7,650 feet and another well is being deepened to the new producing zone. Production from the Khaur field has been disappointing, but after checking on past geology, it has been decided to drill another deep test at a site that has been selected.

Burmah Oil Co. has drilled some new

wells in the Chauk district of Burma, but unsettled conditions in that country make extensive prospecting impossible.

In Indonesia a certain amount of exploration is being carried on in South Sumatra and East Java. In Sumatra the Royal Dutch/Shell group has two geological parties, two gravity crews and two seismic crews in the field, while in East Java a gravity party is at work. Eight rigs are engaged in exploitation and two in exploration.

In New Guinea NNGPM is carrying on an intensive exploratory campaign. Three geological groups, three gravity parties and one seismic crew are engaged in surveys, three rigs are working on drilling tests and two rigs have been added to development drilling to increase production, which in 1953 amounted to 1,752,000 barrels.

On the other side of the island, in Papua, Australasian Petroleum (Pty.) and Island Exploration (Pty.) have been conducting an airborne magnetometer survey over a large area. Ground surveys are being extended with helicopters employed to supply seismic crews working in the jungle. Heavy pressure encountered in No. 1 Onati well at 13,743 feet, which is a record depth for this part of the world, was followed by caving which froze the drill string and stopped drilling until a high pressure well head and special fishing tools could be brought in. Work on a second well in this field is to begin as soon as a road to the site, now under construction, is completed.

Discovery of oil in eastern Australia, already widely publicized, was the highlight of the past year in the island continent and is expected to lead to extensive activity in that state during the coming year. The discovery well found an oil zone at 3,605-3,620 feet which flowed at 550 b/d through a ¼-inch choke. Since that time, the drill has been carried 2,000 feet lower with no further oil showings. The original plan called for a maximum depth of 12,000 feet to test all formations.

Rising demand for oil in the Pacific area is responsible for an intensive exploration drive in British Borneo. Four groups of geologists, two seismic parties and a gravity meter crew are actively engaged in field work. Six rigs are doing exploratory drilling while three others are occupied in testing and development work. Production, now above 100,000 barrels daily, is expected to rise during the coming year.

On the continent of Africa, where concessions covering millions of square miles are held by various international groups, exploration is proceeding apace. Latest addition to the ranks of concession holders is the Conorada Company, composed of American interests, which has just received exploratory rights covering 72,000 square miles west of the Nile and extending to the Libyan border. Activity in Egypt has been confined recently to the Sinai area where Shell and Socony have just made arrangements to extend their drilling. Elsewhere in northern Africa where French, British and American companies have extensive holdings, a dozen or more field parties are working on geological and geophysical surveys in Algeria and Tunisia with a number of rigs employed in test and core drilling.

In the interior of the continent a small showing of oil has been obtained in the Calabar province of Nigeria by the Shell D'Arcy Petroleum Development Co. in an exploratory test. The oil is associated with a considerable volume of gas and further testing is in progress. A previous well drilled at Owerri to 11,000 feet was found to be dry after a showing of gas. The company is extending exploration on its concession of 56,000 square miles with six geophysical parties, two rigs employed in exploratory work and other outfits on core drilling.

The same company is conducting exploration on the Tanganyika coast and a neighboring island, using seaborne transport in part and operating under licenses from the governments of Tanganyika and Zanzibar. A comprehensive air photo survey has been made of the area by Hunting Aero Surveys. On the small island of Mafia, about 20 miles off the coast, geophysicists of the company have made a seismic survey, but drilling has not yet been undertaken. In other parts of Africa, including Mozambique, Angola, the Belgian Congo, French Cameroons and Somaliland, exploration is in preliminary stages or planned.

Exploration activity is general in Europe. Operations in Germany and Italy are described in articles appearing on other pages of this issue. From behind the Iron Curtain come reports of large additions to production in the Soviet Union and in Romania, but as usual without definite details. Elsewhere on the continent exploratory drilling is being pushed in southern France, in Yugoslavia, in Holland where the NAM, jointly owned by Royal Dutch/Shell and Standard (N. J.), has three rigs engaged in exploratory tests and five at work in development drilling with a seismic party engaged in further surveys.

The search for oil in the United Kingdom persists in spite of limited results obtained in recent years. During 1953, however, an encouraging development was the finding of oil at Plungar in Nottinghamshire at 2,820 feet. While the well yielded only about 30 barrels per day, it was sufficient to lead to the sinking of another bore in which oil showings were encountered at similar depth and in which testing is now going on. A site has been selected for a third test. This work is carried on by D'Arcy Exploration Co., the producing arm of Anglo-Iranian, which earlier in the year abandoned a test drilled on the Isle of Wight to 5,200 feet.

A well drilled by Steel Bros. & Co. at Croxteth has been carried to a depth of 3,750 feet and is now being tested. Ground seepages in this section of Lancashire have encouraged repeated efforts to locate their source, generally believed to lie in a deeper formation.

A search for gas in different parts of the country is being conducted by D'Arcy Exploration on behalf of the Gas Council. This campaign is planned to cover the southern part of England and to extend as far north as Scotland at an estimated cost of £1,000,000 or more.

Assam Oil Co. well being drilled in northeastern India is the first stage in the development of oil found in the Brahmaputra Valley alluvium late last year. Objective is 10,000 feet.

New methods aid progress of offshore drilling

Six-well derrick erected on drilling platform in Gulf of Mexico. LST serves as supply depot and crew quarters. Photos courtesy Lee C. Moore Co.

WHEN OIL MEN FIRST ventured offshore from the coasts of Louisiana and Texas to test the theory that oil might be found under the nearby waters of the Gulf of Mexico, they found that they were entering upon a new and strange territory with conditions materially different from those they had encountered in inland drilling and with special problems that made submarine operations many times more expensive.

The theory was logical enough, for it was natural to assume that the line where land and water met was an accident of nature and that the same geological formations that extended down to the water's edge must continue further out. In Louisiana especially, there were great areas that were neither land nor water, but a baffling mixture of both. In these shallow areas many wells were drilled from barges heavily loaded and sunk to the bottom which provided a sufficent foundation to support a derrick and the necessary drilling equipment. When it came to testing locations in the open waters of the Gulf something much more elaborate and expensive was required.

Geophysical surveys had determined the existence under the surface of numerous salt domes, some of them of extraordinary size and extent. These structures, usually associated with the presence of oil, are of frequent occurrence in the delta district of the lower Mississippi and at varying distances off the Louisiana coast and they determined the sites first selected for open water tests.

Like everything else connected with marine operations, the preliminary geophysical work was several times as expensive as similar exploration on land. Each survey required the employment of a number of vessels of different sizes and the bringing into play of new methods of mapping and recording, of locating shot points and determining positions. The cost of maintaining a fully equipped marine crew may run from $75,000 or $85,000 a month upward. Experience and

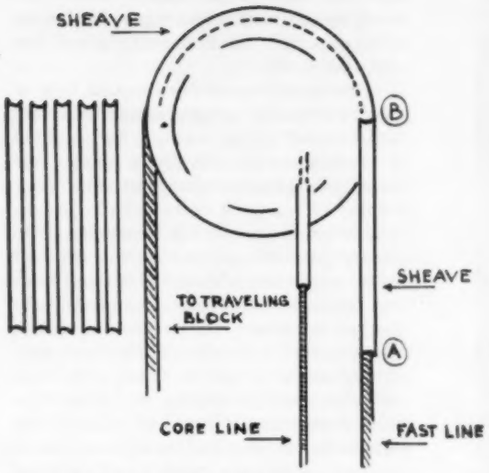


Fig. 1: View of crown block from driller's side on new six-well derrick.

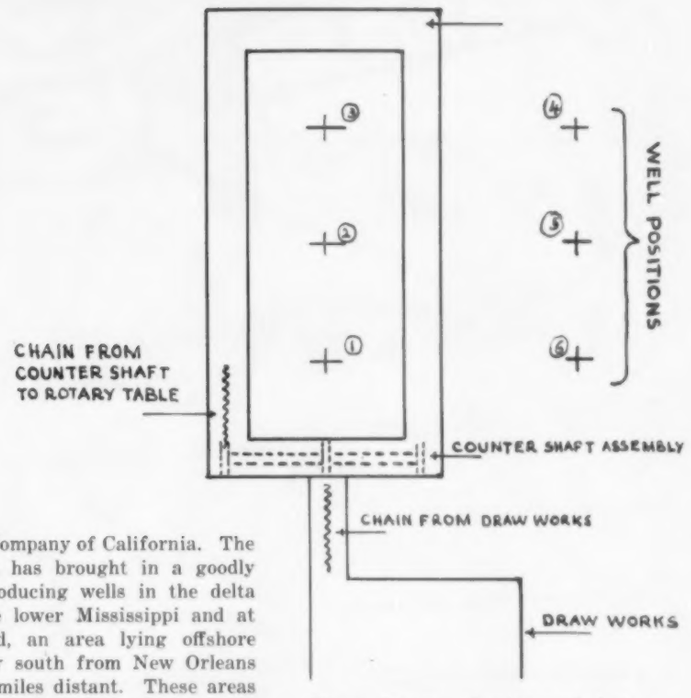
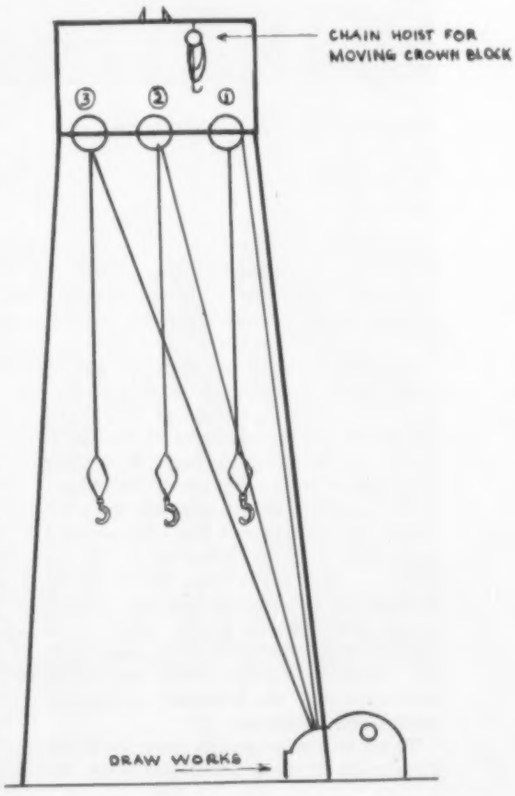


Fig. 2: Diagram showing method of transmitting power to rotary table. Chain from counter shaft is lengthened for well positions 2 and 3 or 5 and 6.

Fig. 3: Diagram showing method of positioning crown block directly over draw works for each well.



invention, however, have led to the development of a whole new chapter in this field of exploration.

In undertaking drilling tests in the open waters of the Gulf, sometimes several miles from shore and in depths up to 60 feet or more, certain important provisions had to be made. A primary one was a firm foundation not only capable of supporting the heavy weight of machinery and supplies, but also solidly built to resist the heavy storms that sweep across the area at certain seasons. Quarters to accommodate the crews had to be provided and facilities for communication and transportation between the drilling site and its land base had to be supplied.

The earlier stations built for these drilling sites were elaborate islands of steel resting on piles sunk to a firm base and rising thirty to forty feet above the surface to be out of reach of the huge waves whipped up to a height of forty or more feet when a hurricane struck. Space was provided not only for drilling and pipe handling, but also for living quarters and for storage of supplies.

Later it was found more economical to utilize service ships to handle supplies and to provide living quarters for crews, permitting a reduction of platform space and providing at the same time a factor of safety since companies engaged in offshore operations maintain a weather service which gives warning of approaching storms and if these assume dangerous proportions, with a ship at hand, the whole working force can be quickly transferred to shore. Several companies operating in the Gulf have purchased LST vessels (landing ship, tanks) from the government and have remodeled them for use in this service at a cost of three quarters of a million dollars or more which is still less than the expenditure required for the platform space which it replaces.

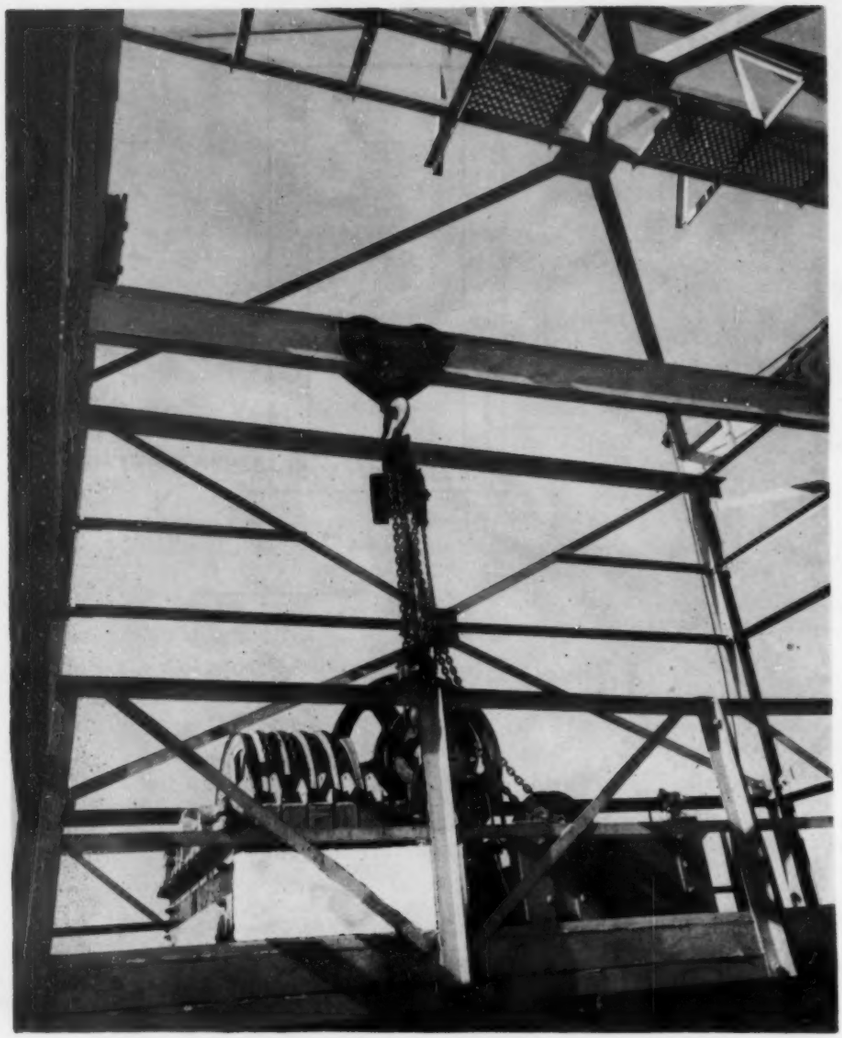
One of the organizations that has been particularly active and successful in its operations off Louisiana shores is The California Company, a producing arm of Standard Oil Company of California. The California Co. has brought in a goodly number of producing wells in the delta district of the lower Mississippi and at Bay Marchand, an area lying offshore almost directly south from New Orleans and about 60 miles distant. These areas may be regarded as typical of the development taking place in the hunt for submarine oil.

The Bay Marchand field had the advantage of containing a huge salt dome the top of which is an ellipse some five by seven miles in extent. The second well put down was a producer and of the wells thus far drilled, 35 have been producers and 8 dry holes. These wells are drilled from platforms borne on piles 200 to 225 feet long, constructed of welded steel pipe and rising 35 to 40 feet above the water.

Offshore activities of the California Co. began in 1948 with the discovery of the Main Pass Block 69 field. Following this, in 1949, came the discovery of the Bay Marchand field. Bay Marchand today has some 33 producing wells, of which eight are under consideration for reworking. Production is currently some 4,600 barrels per day. Some 18 wells are now producing 3,800 barrels of oil per day at the company's Main Pass Block 69 field.

The company was already accustomed to drilling in piney woods, rolling hills, swamplands and mountains. Headquartered in New Orleans, the company's operating territory extends throughout the oil areas of most of the western oil states, but open water drilling was something else again, presenting new conditions. Transporting men and equipment to the offshore location is in itself a task of considerable importance. Boats and airplanes are the answers, and the company uses boats such as LST's, LCT's, air-sea rescue boats, crash boats, sea mules, barges and special crew-boats. Additionally it operates a PBY amphibious airplane in the area.

An integral part of offshore drilling is the LST. Calco's LST's, which have been



Special crown block and chain hoist.

converted specifically for this use, are moored next to the drilling platforms. There they serve as living quarters for drilling crewmen on the platforms and also hold tubing, drill pipe and other supplies.

Recently the California Company has reconditioned its offshore drilling equipment, has built an additional 10-well development drilling platform at Bay Marchand and has again engaged in drilling development wells using two drilling rigs.

To maintain safety and efficiency the company's requirement for complete and specialized weather information in the Gulf area goes beyond that which can be supplied by the Weather Bureau as part of its general public weather service. A consulting meteorologist under contract to the company forecasts wave and water conditions and the behavior of tropical storms and hurricanes.

To get maximum results from the heavy investment in these island platforms, directional drilling has been practiced from the start and several wells have been put down from one platform. In the beginning the derrick and its equipment had to be moved for each new well. As a time saver, the California Co. adopted the plan of placing two rigs on a single platform and thereby was able to drill ten wells from one base, all of which, incidentally, were producers. In the Bay Marchand field the company has six platforms located at distances ranging from a quarter mile to a mile apart. It has drilled 35 producing wells.

When drilling wells from an offshore platform using a conventional derrick, the rig must be skidded from one well location to another on the platform, a time-consuming operation. Placing two drilling rigs on one platform was an improvement, but a still further advance in more efficient offshore operation was introduced in a derrick which is now being used at the company's Main Pass Block 69 field and which has a distinction of its own: it is the first multiple-well derrick ever built.

A principal reason for the new type of derrick is that it permits a marked saving in the cost of piling, enabling the platform to be constructed with fewer pilings, and fewer pilings mean less expensive platforms.

This latest innovation in marine drilling equipment is a rig that can drill six wells from a single platform without moving the derrick. Designed and built by the Lee C. Moore Co., it has the double advantage of requiring a platform only about half as large as those previously built for multiple drilling and there is a great reduction in time lost between the completion of one well and the start of another. The new multiple-well derrick allows the six wells to be drilled without ever moving the derrick and draw works, simply by moving the crown block and rotary table, and crews can change over and begin drilling a new well within a maximum of 12 hours.

The new derrick stands 140 feet high, four feet higher than most, and has a base of 40 x 45 feet, which is considerably larger than the usual 30 x 30 foot base. It can drill two rows of three wells, with 7½-foot spacing between wells and 10-foot spacing between rows.

In this arrangement the draw works are located about midway of one side of the platform with three prospective drill holes on either side. A counter shaft assembly is installed to convey power from the draw works to the rotary table. This unit is 10 feet in length and has three sprockets to carry chain from draw works to table. The counter shaft is placed in front of the draw works and a chain connecting to the center sprocket drives the shaft. The chain is lengthened to drill the second and third wells on one side and the process is reversed for the wells on the opposite side.

The crown block is so designed that it will receive the fast line from the draw works drum at approximately the center of the derrick and carry it far enough to right or left so that the traveling block is directly above the hole to be drilled. The line is carried to right or left by means of idler sheaves set at right angles to each other. As shown in the accompanying drawing (Fig. 1) the line from the draw works passes under one sheave at A and over the second at B. This makes the line actually turn a corner and end up in the position required to meet the traveling block at the right point to drill any one of the six holes. When drilling operations are shifted from one side of the derrick to the other, the traveling block and crown block are restrung.

The derrick floor is made in movable sections which can be removed as needed to accommodate the rotary table. Movable beams across the width of the derrick opening are adjustable to each position for stacking pipe. The successive steps in

platform construction are indicative of the progress being made toward reduction in one of the heaviest investment items connected with marine drilling which, together with other steps toward more efficient and economical operation, gives hope of putting marine production on a basis competitive with mainland wells.

To move the equipment and supplies required in offshore drilling and to provide adequate quarters for the crews, The California Co. has acquired LST ships built originally for war service and has converted them into a combination floating power plant, hotel and supply ship. These vessels are 316 feet long and 50 feet wide and have room on board for 40 men in addition to the ship's own crew. In supplying offshore drilling crews the forward holds are stacked with pipe and drilling equipment. Ballast space is utilized for mud and mud pumps. Kitchens, mess halls and recreation rooms are on the main deck. When the service ship reaches a drilling platform she anchors bow-on near enough so that a bridge can be laid across to provide passage for men and light supplies while heavy materials are transferred by slings.

Once production is obtained, it presents the problem of transporting the oil. Where the volume to be handled was not large, this problem usually has been solved by the use of barges. Tankers could conceivably be employed for the purpose, but The California Co. decided in favor of pipe lines. Gathering lines from the various wells of the Bay Marchand field connect with two 4-inch lines some two and a half miles long to a tank farm on shore from which the oil is shipped to processing plants.

A few statistics bear out the tremendous cost involved in offshore operations:

A recent estimate said that the oil industry has spent $220 million offshore in Louisiana on lease bonuses, rentals, geophysical work, drilling platforms, drilling wells and purchasing equipment.

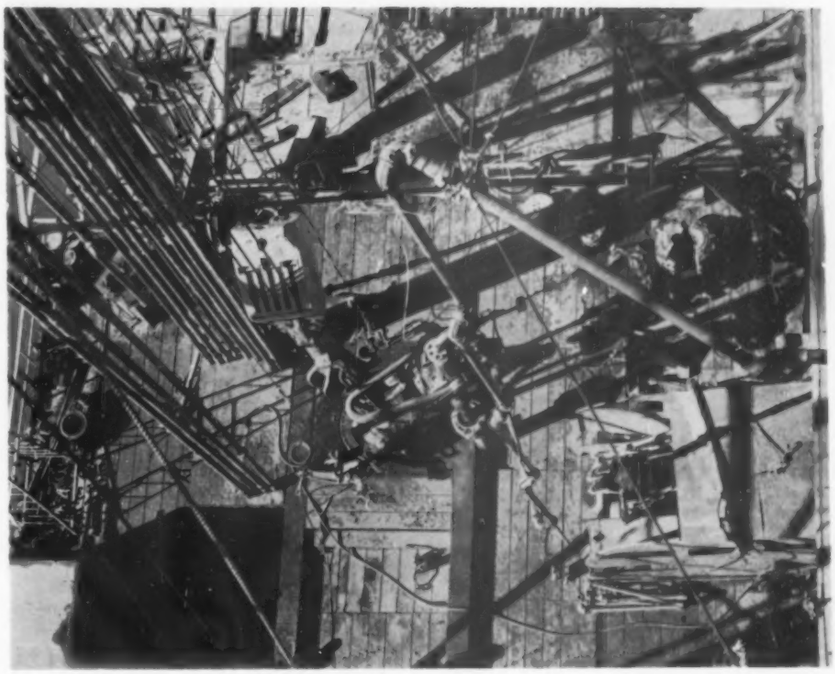
Of 195 wells drilled, the estimate said, 108 were productive and 77 were dry. Approximately 25 fields have been discovered. A common figure for the production from the offshore fields today is 17,000 barrels of oil per day.

The total oil recovered from these offshore fields on about the same basis is roughly 22 million barrels. This represents a gross value of about $60 million, minus offshore operating costs which are higher than those on land, as the return so far on the $220 million spent.

To the cost of acquiring the lease and doing geophysical work must be added up to $900 000 for an exploratory well platform and from $200,000 to $500,000 for drilling the well.

Tremendous investments, technical know-how and specialized equipment designed for water-bound locations are today meeting the challenge posed by offshore oil operations in the Gulf of Mexico.

Derrick floor is in movable sections to accommodate rotary table in different positions.



Forble platform and movable monkey board on six-well derrick.

Henry J. Struth, author of the accompanying article, is the editor of the new WORLD PETROLEUM STATISTICAL YEARBOOK, *a Palmer publication, which will be published and made available to the petroleum industry in June of this year. Mr. Struth is widely known in the international petroleum industry as a leading petroleum economist whose analyses of the industry's statistics and economics will make the forthcoming yearbook a much wanted and highly useful volume of facts and figures. Mr. Struth and his capable staff of statisticians are now hard at work in Dallas, Texas, compiling data and making forecasts of the industry's outlook for the new* WORLD PETROLEUM STATISTICAL YEARBOOK.

Exploration costs eight to one over pre-war level

By H. J. Struth

THE SEARCH for new oil supply sources in the United States in 1953 involved expenditures which were eight times greater than those incurred during the pre-war period 1936-40.

At the greatest cost in its history, the oil industry poured into its exploration activities the huge sum of $2,329 million for drilling, leases, geological and geophysical prospecting, and for general overhead expenses. By comparison, in the pre-war period, exploration expenditures averaged only $278 million annually. Thus, in 1953, the oil industry spent $8.37 for each $1.00 expended in the pre-war years.

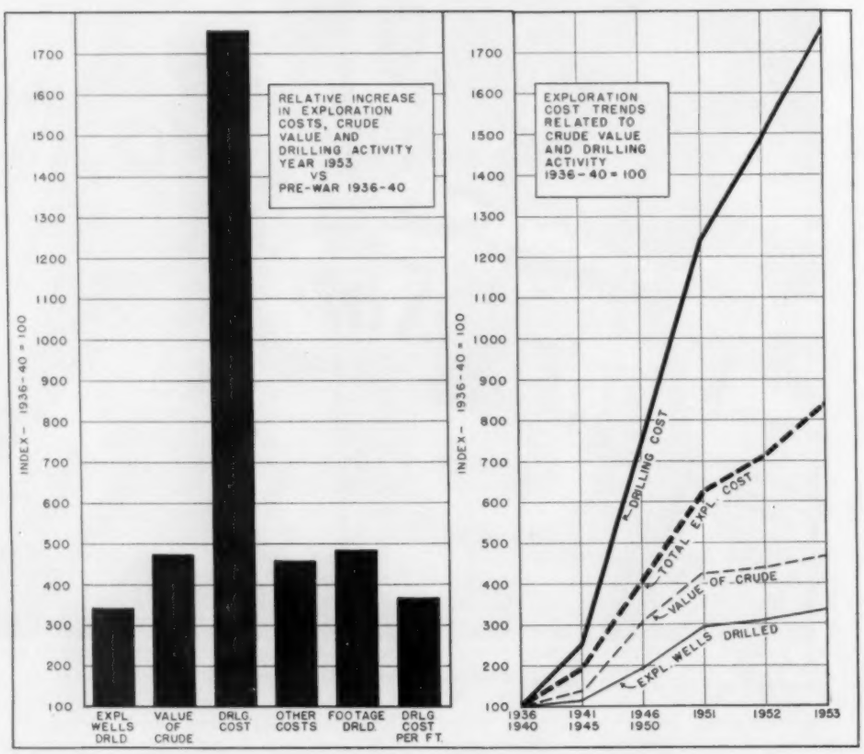
That the search for oil is a highly expensive game is evident from the fact that the average wildcat oil well drilled last year involved a cost, including overhead, of $149,600. Even more startling is the fact that it was necessary to drill 6.6 holes to find one wildcat oil producer, and the combined costs of these amounted to $733,680. In 1953, the oil industry drilled 11,436 wildcat wells, of which only 1,723 were credited with the discovery of oil, while 347 came in as gas producers. The experience last year was 82 dry holes out of every 100 wildcat wells drilled.

Drilling costs have described a phenomenal upward spiral since the pre-war period 1936-40. Today, expenditures for drilling and equipping exploratory wells are 17½ times the sum recorded in pre-war days. Direct drilling costs in 1953 aggregated $1,442 million, compared with $82 million annually during the years 1936-40. The total cost of all types of exploratory wells now amounts to $107,940 each, compared with a pre-war average cost of $43,468.

While labor and equipment costs of the oil industry have advanced, in line with those experienced by everyone else, the costs of exploration have been multiplied to an even more pronounced extent by the factor of depth. In the pre-war period, the average depth of all wells drilled was about 3,000 feet, whereas in 1953 the average depth was 4,060 feet. Furthermore, the average depth of wildcat wells drilled last year was 4,725 feet, compared with a pre-war average depth of about 3,300 feet.

The average cost per foot of hole drilled, including equipment, is now about $15.26, compared with an average cost per foot in pre-war days of $4.13. The experience of the oil industry proves that the cost per foot advances in direct relation to the depth of hole drilled. Where a 3,000-foot well may cost $7.00 or $8.00 per foot, a well drilled to a depth of 12,000 feet will cost from $25 to $30 per foot.

Greater efficiency and remarkably improved equipment have enabled the oil industry to drill wells with far greater speed than formerly. While this develop-



ment has undoubtedly had an offsetting effect upon rising labor and material costs, the trend of deeper and deeper drilling has, at the same time, resulted in materially increased costs. If drilling depths had not necessarily been increased beyond those recorded in pre-war years, today's costs undoubtedly would have been far more favorable. It is obvious, therefore, that the depth factor has been a predominating factor in the oil industry's constantly rising cost of exploration.

Recurring attacks on the oil industry's statutory depletion allowance of 27½ percent brings the reasoning that prompts such actions under question. The facts engender the realization that an adequate depletion allowance is of greater necessity today than ever before. If the allowance prescribed by Congressional action in 1926 was deemed reasonable and adequate to insure uninterrupted search for oil reserves, it should be obvious that today's conditions and far greater costs provide irrefutable evidence of the wisdom that prompted the enactment of this long-established statute. However, in the light of today's high costs, and the necessity for greatly expanded reinvestments of capital for exploration, the weight of evidence is on the side of a higher, rather than a lower, depletion allowance.

The value of crude oil in the United States last year, after deducting the royalty owners' interest, aggregated $5,491 million. Exploration expenditures of $2,329 million represented 42.4 percent of the gross income of all oil operators. By comparison, such expenditures in the pre-war years, 1936-40, comprised an annual average of 24.1 percent. During the entire period of 18 years, however, the oil industry's expenditures for exploration have averaged 36.6 percent of the gross working interest value of all the crude oil produced in the United States. These facts offer little to support the oft-repeated contention that the depletion allowance of 27½ percent is excessive, or that it is a tax "loophole."

The security of the nation, in war and in peace, is vitally dependent upon an adequate supply of petroleum. The depletion allowance has long and effectively played a vital role in providing an increasingly greater flow of risk capital in the unrelenting search for new sources of future oil supply. The privilege, if it may be so termed, of deducting 27½ percent from the taxable income of oil producers has long been the enabling factor in the oil industry's successful maintenance of adequate underground reserves of petroleum, as well as the means of providing a necessary margin of safety in the nation's productive capacity of oil. Without the incentive and the means provided by the depletion allowance, the nation might not have attained the favorable and enviable position it holds today among the oil producing nations of the world.

Long-range studies of demand for petroleum and its products emphasize the need for an unrelenting, incessant search for oil reserves in the United States. The facts indicate that the search has been pursued by oil men with increasing vigor, despite the upward spiral in oil finding costs. The records make it clear, also, that the hunt for new oil fields in the United States is not as lucrative as it was prior to World War I. In recent years the oil industry has not made any sensational oil field discoveries, such as Kettleman Hills, Oklahoma City, Conroe and East Texas. Major oil field discoveries are few and far between, and the search becomes more difficult each year, as well as more expensive. In the pre-war years, the industry discovered 9.53 barrels of oil for each dollar spent in exploration. In 1952, latest data of reserves discoveries available, the incidence was only 1.66 barrels per dollar spent in exploration. This is oil in place, underground, which must pay, in addition, the costs incidental to development and production.

Indicative of the expanding effort of the oil industry to find oil in the United States is the trend of exploratory wells drilled. In 1953, a new all-time peak was attained, with a total of 21,573 exploratory wells, compared with 19,350 in 1952, and an annual average of 6,400 such wells drilled in the pre-war period 1936-40. These include wildcat oil producers and all dry holes drilled in the search for and development of oil production. Today, the oil industry is drilling 3.37 exploratory wells to one drilled in the pre-war period, while the footage drilled is in the ratio of 4.74 to one in the pre-war years.

The hazards attending the search for oil are emphasized by the fact that 88 cents of every dollar spent for exploration in 1953 was consumed in drilling dry holes. The industry drilled 19,850 dry holes, for which the average cost, including all indirect and overhead charges, amounted to $104,000 each. The combined direct and indirect cost of all dry holes drilled last year aggregated more than two billion dollars. By comparison, the 1,723 discovery oil wells completed during the year involved a combined cost of only $257 million.

Direct drilling costs comprised 61.9 percent of the total exploration expenditures in 1953. Other costs, including leases, geological, geophysical and general office overhead, added 38.1 percent. Landowners received nearly $523 million in lease rentals and bonuses during the year 1953. This sum comprised an average of over $24,000 per exploratory well drilled.

EXPLORATION EXPENDITURES IN 1953 (p)

Drilling Cost	No. of Wells Drilled	Average Cost Per Well	Total Cost (Thous. $)
Discovery oil wells	1,415	$110,700	$ 156,640
Extension oil wells	308	98,400	30,307
Wildcat dry holes	9,366	79,950	748,812
Total New Fields & Ext.	11,089	84,386	935,759
Development dry holes	10,484	48,300	506,391
Total Drilling Cost	21,573	$ 66,850	$1,442,150
Other Costs			
Leases		24,243	522,994
Geol. & Geophys. Prosp.	21,573	11,505	248,197
Overhead cost		5,342	115,243
Total Other Costs	21,573	41,090	886,434
Grand Total Cost	21,573	$107,940	$2,328,584

(p) Preliminary estimates

COST OF WILDCAT PRODUCERS AND DRY HOLES IN 1953 (p)

	Wildcat Producers	All Dry Holes	Grand Total
Drilling Cost (Thous.)	$186,947	$1,255,203	$1,442,150
Other Costs (Thous.)	70,798	815,636	886,434
Total Cost (Thous.)	$257,745	$2,070,839	$2,328,584
No. of Wells	1,723	19,850	21,573
Avg. Cost per well	$149,600	$ 104,300	$ 107,940

TOTAL WELLS DRILLED IN 1953 (p)

	Wildcats	Development	Total
Oil	1,723	24,277	26,000
Gas	347	3,563	3,910
Dry	9,366	10,484	19,850
Total	11,436	38,324	49,760
Footage drilled*	54,035	147,991	202,026
Average depth	4,725	3,860	4,060

Note:—Excludes input wells. *Thousands of feet. (p) Preliminary estimates.

EXPLORATION COSTS IN THE UNITED STATES

	1953 (p)	1952	1951	Avg. 5 Post-war Yrs. 1946-50	Avg. 5 War Years 1941-45	Avg. 5 Pre-war Yrs. 1936-40
Explor. Wells Drilled*	$ 21,573	19,350	18,760	12,585	7,145	6,400
Drilling Cost (Thous. $)	1,442,150	1,217,365	1,018,565	604,663	201,366	82,351
Leases (Thous. $)	522,994	464,500	447,020	340,204	214,698	131,619
Geol. & Geoph. (Thous. $)	248,197	193,500	165,830	93,109	57,052	35,249
Overhead (Thous. $)	115,243	111,880	108,160	74,166	48,669	28,978
Total (Thous. $)	$2,328,584	$1,987,245	$1,739,575	$1,112,142	$ 521,785	$ 278,197
Average Cost per Well						
Drilling (a)	$ 66,850	$ 62,900	$ 54,300	$ 48,046	$ 28,183	$ 12,867
All Other	41,090	39,800	38,300	40,324	44,845	30,601
Total	$ 107,940	$ 102,700	$ 92,600	$ 88,370	$ 73,028	$ 43,468
Footage drilled (Thous.)	94,505	84,635	75,903	46,668	24,864	19,932
Average depth	4,380	4,374	4,046	3,708	3,480	3,114
Drilling Cost per ft. (a)	$15.26	$14.38	$13.42	$12.96	$8.10	$4.13
Other costs per ft.	9.38	9.10	9.50	10.87	12.89	9.86
Total cost per ft.	24.64	23.48	22.92	23.83	20.99	13.96
Value of Crude Oil (b)	$5,491,000	$5,017,600	$4,912,640	$3,579,146	$1,563,189	$1,158,607
Percent for Explor.	42.4	39.6	35.4	31.7	33.4	24.1
Reserves Discovered (Mill)	(NA)	3,306	5,138	3,516	2,013	2,650
Res. per Explor. Dollar		1.66	2.95	3.16	3.86	9.53
Index Relative to 1936-40						
Explor. Wells Drilled	337	302	293	197	112	100
Value of Oil	474	433	424	309	135	100
Drilling Cost	1751	1478	1237	734	245	100
Other Costs	453	393	368	259	164	100
Total Explor. Cost	837	714	625	400	188	100
Footage Drilled	474	425	381	234	125	100
Drilling Cost per ft.	369	348	325	314	196	100
Index Relative to 1946-50						
Explor. Wells Drilled	171	154	149	100		
Value of Oil	153	140	137	100		
Drilling Cost	238	201	168	100		
Other Costs	175	152	142	100		
Total Explor. Cost	209	179	156	100		
Footage Drilled	202	181	163	100		
Drilling Cost per ft.	118	111	104	100		

(p) Preliminary estimates. (*) Includes wildcat producers and all dry holes drilled in search for and development of production.
(a) Includes equipment. (b) Net working interest. Thous. $.
(NA) Not as yet available.

Other costs, shown in the accompanying tables, added nearly 15 percent, and averaged about $16,000 per well drilled.

Expenditures for leases have quadrupled since pre-war days, reflecting the intensive, competitive search for prospective drilling sites. Today, over 210 million acres of prospective petroleum-bearing lands are under lease by the oil companies in at least 30 states. Lands now under lease by the oil industry are equal in size to the combined area encompassed by the states of New York, Pennsylvania, Ohio, Indiana, Illinois, Michigan and about three fourths of the state of Wisconsin. This area is equivalent to about 328,000 square miles.

At least 750 crews are at work in all parts of the nation, prospecting for new oil and gas fields by geophysical and other scientific methods. This is about 3½ times the number of such crews engaged in the pre-war years of 1936-40. The cost of geological and geophysical operations is now about seven times that of the pre-war level, and aggregated a cost of about $248 million in 1953. While the march of science has greatly facilitated the mapping of oil-bearing structures in the United States, the final test of any area must be made by drilling, and the results can only be finally and definitely measured by the incidence of dry holes in relationship to discovery wells. The best scientific minds in the oil industry admit that greater effort and vastly greater sums of risk capital are necessary to insure a continued, uninterrupted supply of petroleum to meet future requirements of the United States. Money is the prime requisite to successful exploration for hidden oil deposits, and the depletion allowance is the keystone of the oil industry's exploration structure.

Overhead, which occupies an important role in every business, has grown to a sizeable figure in the business of finding oil. Overhead expenditures chargeable to oil exploration last year aggregated more than $115 million, an increase over pre-war of some 300 percent. Today, the cost of overhead per exploratory well amounts to $5,300, compared with a pre-war average of about $4,500. Comparisons of costs on a per well basis clearly indicate that the costs of drilling and equipment have borne the brunt of the upward spiral in exploration costs, in which the depth factor has undoubtedly played a leading role.

The accomplishments of the petroleum industry in building a dependable future supply of petroleum, through the funds partly made available by the depletion allowance, provide a sound argument for its retention. Today, the nation's bulwark of underground oil reserves amounts to some 34 billion barrels, which comprises an increase of 25.5 billion barrels since 1926, the year when the depletion allowance was established. During this span of years, oil reserves discovered have aggregated about 79 billion barrels, from which there have been produced some 45 billion barrels. Despite the growing demand for oil, and the continually rising cost of exploration, the industry has managed to maintain underground reserves at a consistently safe margin of availability.

The oil industry might well counter dissenters to the depletion allowance with the question "To what better purpose could this money be dedicated?" The crux of the matter rests upon the firm conviction that the money available through the depletion allowance has definitely served an altruistic purpose, and its continued availability offers a sound investment in the future security and economic welfare of the nation.

Three major discoveries in Canada reward 1953 exploratory work

DEVELOPMENT DRILLING continued to increase at a moderate rate in Western Canada during 1953 and has been maintained at a steady pace in the first two months of the current year. Wildcatting was somewhat less active and geophysical reconnaissance was at a lower rate than in 1952. The industry spent an average of $1 million daily during the year for reconnaissance and production development.

Although fewer exploratory tests were drilled, it now seems probable that discoveries for the year may be the greatest since Redwater and possibly the greatest in the history of Western Canada. In the late months of the year three discoveries were made which are expected to be of major importance.

Canadian reserve figures for the year end are expected to be placed at about two billion barrels by the official survey committee. This would indicate an increase for the year of about 320 million barrels. Because of the rules under which they are compiled, the official figures will not, however, be indicative of the importance which operators place on the Pembina discovery in Alberta, Smiley in Saskatchewan and Roselea in Manitoba.

About 65 miles southwest of Edmonton, the Pembina field is now rated as a major find with reserves estimated at 600 million barrels and more. It is suggested that the field may cover as great an area as East Texas when it is finally drilled up. The volume of oil to be recovered will not be as great, however.

Production at Pembina is from the Cardium sand which has long been known to exist in the foothills region, but not highly regarded as a source of oil. The sand is not highly permeable, but responds well to modern fracturing methods. Depth is slightly below 5,200 feet.

Attitude of producers toward the field is best seen in the bids which were filed with the Alberta government on January 26. At that time The Texas Co. interests paid $13,000,125 for a Crown reservation of four townships some eight miles from the nearest producing well. Imperial Oil Ltd. paid $11 million for a similar reservation north of the Texaco tract and still farther away from production. In both instances the companies will be required to turn back half the acreage so that the bonus cost for land to be finally leased from the government will be at least $280 per acre on the Texaco tract and $240 per acre on the Imperial tract. Small 160-acre leases offsetting production brought bonuses as high as $320 per acre. Canadian Gulf paid $470,000 for a quarter section, Luscar Coals Ltd. et al $525,000 and Trans Canada Petroleums Ltd. et al $505,828 for another quarter section.

As this is written the Cardium sand has been found productive in an area eight miles wide by 10 miles long. A showing has been reported in the same sand as far as 50 miles from the discovery. All told, light oil was found in an area embracing 250,000 acres in four separate sands: the Cardium, Belly River, Viking and Basal Blairmore.

Amerada's Sturgeon Lake discovery of 1952 has been enlarged by added drilling in 1953 to assure that it is a major find. The field is some 175 miles northwest of Edmonton. Production has been found in a Devonian reef over an area 20 miles in length. Additional drilling is to be done this year to determine the extent of the find.

In central Alberta wet gas and light oil was found in important quantities in the Homeglen-Rimbey area, another D3 reef south of the group previously discovered near Edmonton.

Major discovery in Saskatchewan was the Smiley field which was uncovered last September in a search for gas. It is the first major light oil field in the province and has been estimated as having reserves ranging from 50 to 100 million barrels.

By the end of the year 38 wells had been completed at Smiley by Imperial, Canada Southern Oils Ltd. and Hudson's Bay Oil & Gas. Full extent of the field will not be known until many more wells are drilled.

Although a large proportion of the field activity in Western Canada still centers in Alberta, there was a remarkable increase in Saskatchewan drilling in 1953. Completions rose 36 percent to 663, whereas there was a drop of 10 percent in Alberta to 1,420. Drilling in Western Canada as a whole was up about two percent over 1952.

The Department of Mineral Resources of Saskatchewan reported 679 drilling licenses issued in the first 11 months of 1953 compared with 480 in the same period in 1952. Total footage drilled in 11 months was 2,233,329 compared with 1,274,198 feet in 11 months in 1952.

In Alberta 1,345 drilling licenses were issued in 11 months of 1953 compared with 1,589 the previous year. Footage drilled increased slightly from 6,069,858 in 11 months of 1952 to 6,098,453 last year. Drilling operations were tending to rise toward the end of the year.

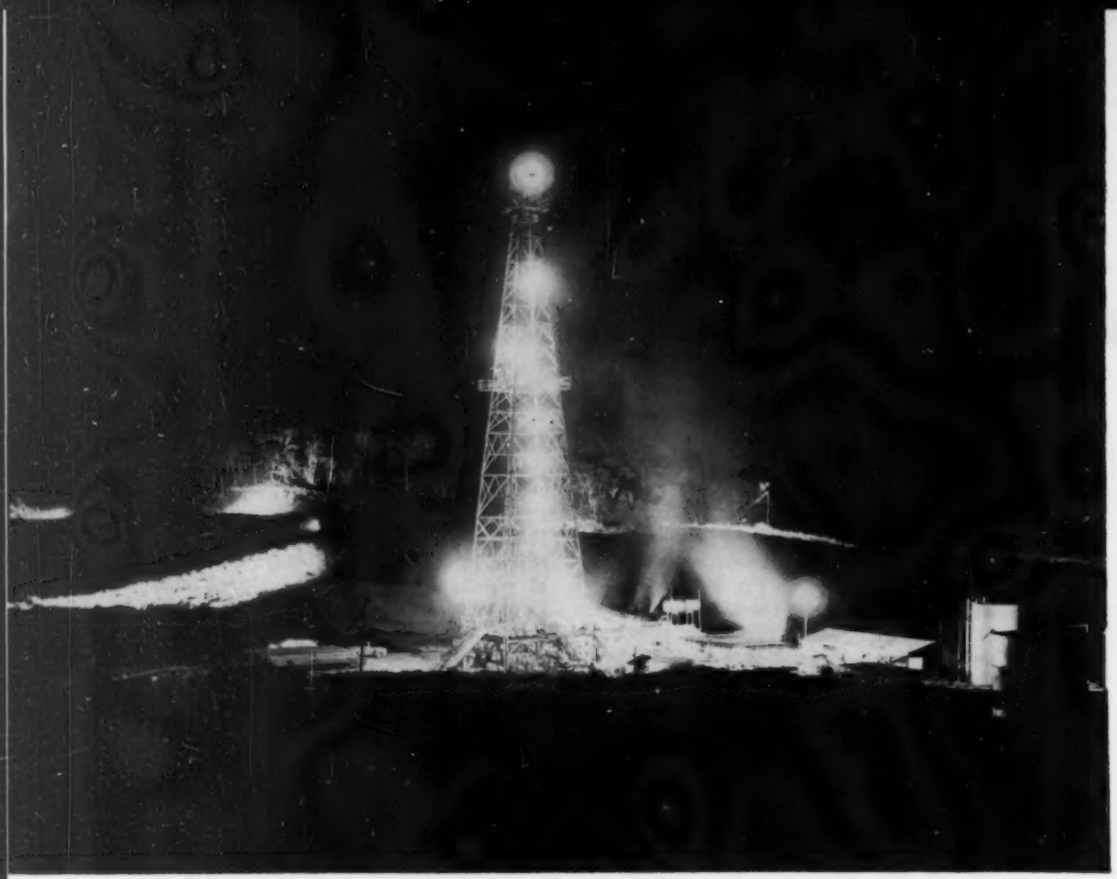
Manitoba's first prolific find was the Roselea field near Virden. Wells in this field are good flowing producers with capacities as high as 2,400 b/d. Daily production in Manitoba rose from less than 300 b/d in 1952 to nearly 1,700 b/d in 1953.

A retarding influence on development last year was the delay in arranging an outlet for gas. The United States Federal Power Commission was conducting a marathon hearing on the application to import Peace River gas into Washington and Oregon. Conflicting interests were seeking the right to move western gas to Eastern Canada. This phase of the gas situation now appears settled with two gas contenders merging at government request to build a $300 to $375 million gas line to the east. Exports to the United States are not yet assured, but action is expected in the early spring.

Alberta producers were disappointed in not finding a market for Prairie crude in California when the Trans Mountain Oil Pipe Line was completed to the Pacific. When the line was ready to operate, Middle East and Indonesian crude was being delivered to San Francisco at a lower price than Canadian oil.

Late in the year, completion of the Interprovincial extension to Sarnia plus the enlarged refinery capacity in that area permitted western crude production to be kept at a higher seasonal level than in earlier years. It is anticipated that western movement of oil will improve late in 1954. Outlet this year will be 100,000 b/d or more below producing capacity. It is estimated that it will average about 280,000 b/d, an increase of about 22 percent compared with the 222,000 b/d produced in 1953.

Settlement of the gas market question plus the late 1953 discoveries are expected to keep drilling activity in 1954 at a high level in Western Canada.



A wildcat well drilling in the interior where extensive illumination is necessary at night to protect workers from attack by Indian tribesmen. All photos courtesy Creole Petroleum Corp.

Exploratory activity in Venezuela

THE MOST MARKED FEATURE of exploratory activity in Venezuela in 1953 was the increase in the number of new-field and new-pool wildcats drilled. There were 130 wildcat completions as against 1952's 98, a gain of 33 percent. Wildcats amounted to 12 percent of total completions, as compared with about 7.5 percent for the years 1949-51. (Table I).

Nearly all operators showed some increase in wildcatting activity. Several drilled twice as many wildcats as in 1952, while the failings-off registered were slight. (Table II).

The average depths of wildcats remained about the same, 7,200 feet, with one striking exception. Shell's wildcats were nearly 2,000 feet deeper than in 1952. One factor here was Shell's drilling of the Bolivar coastal fields deep test, LS-1387. The deepest hole ever drilled outside the United States, this wildcat went to 17,537 feet. Eliminating this exceptional case, the average 1953 wildcat was about 7,000 feet deep, or 200 feet less than in 1952.

Total rig-time was about the same in both years, 1,322 months in 1953 as against 1,339 in 1952. Overall completions averaged about 110 per month in 1952, 88 in 1953. With wildcat completions up by four percent of the total, there was a corresponding decrease in development completions, from about 92 percent of the total in 1952 to 88 in 1953.

An interesting feature was the 60 percent decline in Shell's total completions. (Table III). Historically, Shell's role in Venezuela has been preeminently that of the producer of low-gravity crude from shallow, rapidly-drilled wells in the Maracaibo basin. In 1952, for example, 571 of Shell's total 609 completions (94 percent) were in the Tia Juana, Lagunillas, Bachaquero and Mene Grande fields, where gravities range around 20°API. In 1953, completions in these fields accounted for only 75 percent of Shell's total and the remainder was made in deeper-drilling areas of western Venezuela and in eastern Venezuela, apparently in search of higher-gravity oil.

The search for lighter-gravity crudes which the changing demands of the market seem to be forcing on Venezuelan operators is not confined to this one company. Its case happens to afford an outstanding illustration of the general trend. Other operators are turning to eastern Venezuela, where gravities generally range higher than in the west. This is demonstrated in Table IV, which shows an increase for 1953 of five percent in the rig-time devoted to eastern Venezuela, with a corresponding decrease in western Venezuela rig-time.

The same geographic shift to eastern Venezuela shows up in surface-exploration activity as in drilling rig-time, and in about the same proportion. Table V shows a 4.5 percent increase in party-months spent in Venezuela last year over 1952.

As the totals show, surface exploration activity has remained almost constant with an average of 41 parties in the field at all times, for a ratio of exploration parties to drilling rigs of about 1:2.75.

The relative proportions of the several types of surface-exploration parties have remained virtually unchanged, except that a slight decrease in structure drilling has been offset by an increase in seismic parties. (Table VI).

A geographical breakdown of the 1953 surface-party effort shows that the states of Monagas and Anzoategui have benefitted most by the shift of interest to eastern Venezuela. In western Venezuela, attention has been diverted from the state of Falcon to the mountain states (Tachira-Merida-Trujullo-Lara), probably in conjunction with studies of the Apure-Barinas basin (which in Table VII is taken to include the states Apure-Barinas-Cojedes-Portuguesa).

One of the most important wildcat developments of 1953 was Sinclair's double strike in Barinas, which was announced very matter-of-factly, in contrast to the secrecy which another company has maintained about its operations. Sinclair tested two new-field wildcats there in 1953, Sinco-1 and 2, for gauges of 1,300 and 1,600 b/d respectively, of 25-28° gravity oil, in the latter case from three sands. This is the first concrete test information to come out of Barinas. While it falls short of the "big well" stories attributed by rumor to earlier holes, it is at least fact and not guesswork, and confirms the belief that the Barinas basin will eventually be the scene of a big play. There will be a stampede to secure concessions there, if and when the government invites bids on new acreage. After that the

Exploratory well being drilled in the Guanoco field, Eastern Venezuela.

Multiple well in Creole's Quiriquire field in Eastern Venezuela. In order to save drilling rig construction costs, two or more wells are drilled close together with the drilling rig being moved on a rail from one site to the next. The wells are drilled to different producing horizons.

TABLE I

WILDCAT COMPLETIONS

	Total Wells	Wildcats	% Wildcats
1949	682	50	7.3
1950	663	43	6.5
1951	1205	93	7.7
1952	1312	101	7.7
1953	1057	130	12.0

TABLE VI

TYPES OF SURFACE EXPLORATION

	1952 Months	1952 %	1953 Months	1953 %
Surface Geol.	224	45.0	222	45.0
Seismograph	205	42.0	215	43.5
Gravimeter	38	8.0	40	8.0
Structure Drill	25	5.0	17	3.5
	492	100.0	494	100.0

TABLE II

WILDCATS BY COMPANIES

	1952 W.C.	1952 Footage	1952 Ft/Hole	1953 W.C.	1953 Footage	1953 Ft/Hole
Mene Grande	32	245,410	7,670	30	235,250	7,840
Texas Co's	22	127,710	5,805	32	170,600	5,330
Shell Co's	15	106,740	7,116	12	108,900	9,075
Creole	11	92,585	8,417	24	185,450	7,720
Ven. Atlantic	6	33,100	5,500	13	72,000	5,500
Socony-Vacuum	4	38,803	9,700	8	76,200	9,525
Sinclair	4	24,010	6,002	6	41,850	6,975
Phillips	3	29,567	9,855	3	30,000	10,000
Richmond	1	8,258	——	1	9,250	——
Pancoastal	—	——	——	1	8,100	——
	98	706,173	7,206	130	937,600	7,212

TABLE III

COMPLETIONS BY TYPES

	1952 Dev.	1952 W.C.	1952 Total	1953 Dev.	1953 W.C.	1953 Total
Mene Grande	253	32	285	250	30	280
Shell	594	15	609	232	12	245
Creole	192	11	203	156	24	180
Texas Co's	39	22	61	82	32	114
Socony	48	4	52	65	8	73
Atlantic	20	6	26	52	13	65
Phillips	21	3	24	38	3	41
Sinclair	17	4	21	26	6	32
Richmond	23	1	24	15	1	16
Talon (BCO)	4	—	4	6	—	6
Pantepec	3	—	3	5	—	5
Pancoastal	—	—	—	—	1	1
	1,214	98	1,312	927	130	1,057

TABLE IV

RIG-TIME

	1952 Months	1952 %	1953 Months	1953 %
Eastern Ven.	753	56.3	799	60.0
Western Ven.	586	43.7	525	40.0
	1,339	100.0	1,322	100.0

TABLE V

SURFACE-EXPLORATION ACTIVITY

	1952 Months	1952 %	1953 Months	1953 %
Eastern Ven.	183	37.0	205	41.5
Western Ven.	309	63.0	289	58.5
	492	100.0	494	100.0

TABLE VII

GEOGRAPHICAL BREAKDOWN OF PARTY-MONTHS

	Total 1953 Party-Months	% of Country	% in 1952	Months Diff.
Eastern Venezuela				
Anzoategui	84	17.0	13.5	+3.5
Guarico	43	9.0	11.0	—2.0
Monagas	68	13.5	7.0	+6.5
Other	10	2.0	1.5	+0.5
Sub-total	205	41.5	37.0	
Western Venezuela				
Barinas Basin	94	19.0	20.0	—1.0
Zulia	61	12.0	11.0	+1.0
Falcon	42	8.5	15.0	—6.5
Mountain States	88	18.0	15.0	+3.0
Other	4	1.0	2.0	—1.0
Sub-total	289	58.5	63.0	
Grand Totals	494	100.0	100.0	

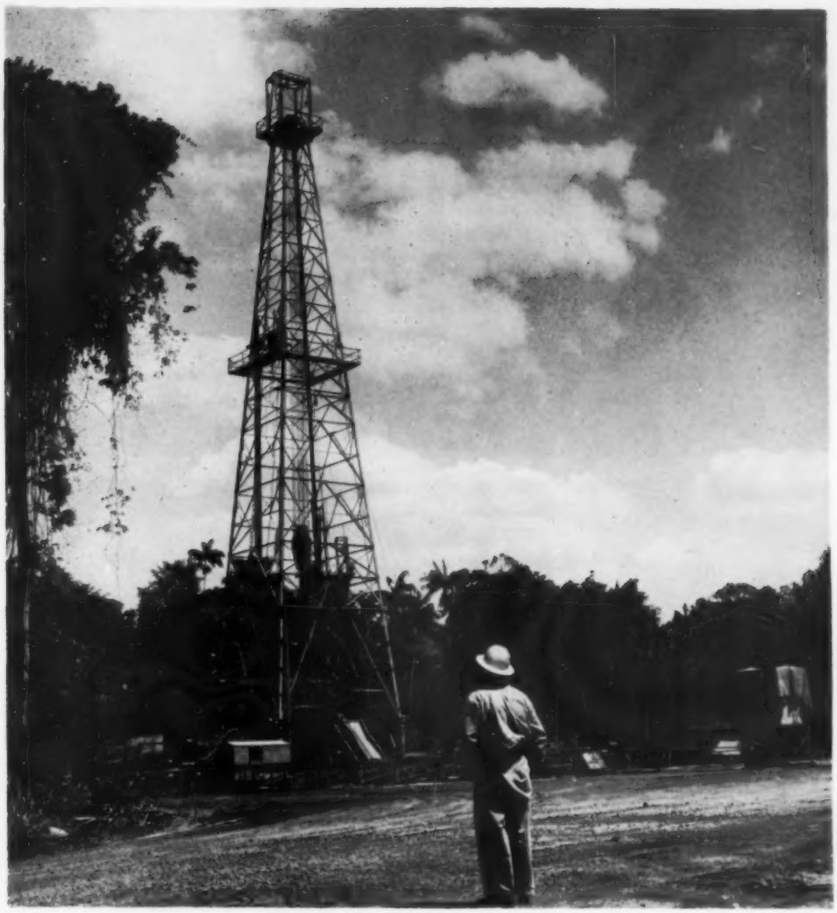
problem will be how to get the oil to deep water, 240 miles away over very rugged terrain.

Another significant development of 1953 was Shell's discovery that oil is contained in fractures in the basement underlying the Cretaceous limestones in the La Paz and Mara fields. Whether this oil accumulated in a separate reservoir or simply migrated downward from the limestone or some other source is not yet clear. Not much detail has leaked out, but it is generally known that production of several poor producers among Shell's Cretaceous wells has been greatly increased by deepening 1,000 feet or more and re-completing in basement rocks. Some wells have improved by several thousand barrels a day. Texas Company is currently deepening Raban-5, abandoned as a non-commercial producer in the Mara field, and the other operators with Cretaceous wells, Mene Grande and Creole, can be expected to follow suit.

A number of noteworthy wildcats were drilled in Venezuela in 1953. Shell's Bolivar coastal field deep test, LS-1387, was the deepest well ever drilled outside the USA at 17,537 feet. Creole's Alturitas-2, in deep jungle southwest of Maracaibo, was a close runner-up at 17,265 feet. Both were dry holes.

The Shell wildcats, besides being deeper, were more widely distributed over the face of Venezuela than any other company's. In deep waters in Lake Maracaibo, their "VL" wildcats and stepouts were outlining a field of major proportions, 10 miles from north to south. They also drilled three "BU" wildcats, all dry, on a large block of acreage in Apure, far south in Venezuela. Friata-1 was a rank wildcat southwest of Lake Maracaibo, still drilling at year's end. Order-5 was a successful deeper-pool test in the long-inactive Rio de Oro field on the Colombian border. DMM-2 was a 10,000-foot Cretaceous completion proving the possibility of limestone production several miles northeast of Mara to El Mojan. Misoa-1 was a deep test (14,046 feet) which failed near the Bolivar coastal fields. In the latter part of the year, Shell again invaded Anzoategui, where it had drilled two deep dry holes in the 40's, with a six-wildcat program, of which two holes were drilling at year's end. Shell wildcats were also drilled in eastern Monagas, toward Pedernales, but without success.

Mene Grande drilled 30 wildcats which resulted in 18 oil wells, two gassers and 10 dry holes, most of them in Anzoategui. Casca-1, a rank wildcat in northwestern Anzoategui, opened a large virgin tract of acreage, and other operators holding undrilled concessions there can be expected to move in as Meneg's program progresses. Other Mene Grande strikes, in the Greater Oficina area, were made by Nigua, Oveja, Zorro, Oca Yare and others. New-pool discoveries and extensions in 1953 virtually joined the Mapiri, Silla and



Creole Petroleum Corporation well being drilled in the Quiriquire field in Eastern Venezuela.

VENEZUELA PRODUCTION

DAILY AVERAGE BARRELS

Companies	1951	1952	1953
Creole	773,663	810,598	795,990
Shell	527,321	551,740	507,489
Mene Grande	245,273	270,532	279,502
Socony	49,319	58,059	64,555
Texas	23,625	18,975	19,153
Las Mercedes	23,177	25,038	24,198
Atlantic	18,932	17,365	18,372
Richmond	13,489	19,531	20,313
Sinclair	12,481	12,958	16,230
Pantepec	10,042	8,601	9,516
Phillips	6,371	9,586	8,129
Talon	949	938	975
Coro	—	—	}
Others	1	—	566
Totals	1,704,643	1,803,910	1,764,988

East Soto fields into one 17-mile-long producing trend.

Creole drilled more than twice as many wildcats in 1953 as in 1952, most of them in eastern Venezuela. The Trembladór-Pilon-Uracoa complex of small, low-gravity fields in southern Monagas was the scene of a number of new-field and new-pool tests, drilled for evaluation rather than to augment Creole's already ample supply of low-gravity crude from Lake basin fields. Two new fields, East Pilon and El Alsto, were opened up in this way, but probably will not be developed further. In the Pedernales area, where an outlet of the Orinoco meets the Gulf of Paria, Creole drilled dry holes Guanipa-1, Joyo-1 and Hervidero-1, the last going to 13,150 feet. Pedernales PCPX-3 was a shallow new-pool find. New-pool wildcats at Orocual, Jusepin and Quiriquire were in general not effective. In western Venezuela, San Patricio-2 was a try (which did not come off) for a new field near Cumarebo. As 1954 began Creole was drilling PB-247, far out in Lake Maracaibo from Punta Benitez, as a deep test expected to find basement at about 15,000 feet.

Socony, wildcatting side by side with Mene Grande in the Greater Oficina area, added to its producing fields with North Chimire, North Oscurote, Pradera and La Ceibita wildcats. The company also extended its operations into Guarico in 1953, with East Ruiz-1 and a few succeeding development wells.

Most active wildcatter in Guarico was the Texas Company associate, SAP Las Mercedes, with a long series of new-field and new-pool tests which extended existing fields, but in general provided no new major pay. Texas Company wildcatted in the widely separated states of Falcon and Anzoategui. In the former, Tiguaje-1 was a new-field find. Rincon-7 and Mata-4 were new-pool strikes in Anzoategui.

Aside from the Barinas discoveries, Sinclair's wildcatting was unfruitful. Santa Barbara-147 in Monagas was dry, but another stab there, SB-148, was shaping up as a new strike as the year ended. Also dry were Roblote-2 and Camoruco-1, both near the Anzoategui-Guarico border.

Atlantic had some wildcat successes in 1953 and some disappointments. Junta-2 found a new light-gravity field in the southeast Greater Oficina area, Tacat-3 opened up a new source of production for Varco east of Santa Barbara, and Rosita-2 was a new-field discovery in Guarico. However, the latter has been disappointing on follow-up. Guama-2 and Guarico 9-1, near the Anzoategui line, were abandoned as dry. A series of stratigraphic tests (TAGX-2, etc.) failed to extend the Taman field, but a series of new pools was uncovered at Saban field.

Pancoastal's first independently-drilled well in Venezuela (the company's production of 5,000 b/d comes from joint operations conducted by Atlantic) was a wildcat, PCXP-1, located on seismograph evidence in the southeast Greater Oficina area. Drilled to 8,100 feet, it was tested thoroughly, but did not make a well. Pancoastal is, however, studying the results with a view to making a second try in this area.

Richmond's only wildcat of the year, Reco-3J-1, was a dry hole drilled near the Creole wells in Pedernales. At year's end the company was planning a 14,000-foot test in northern Monagas east of Santa Barbara, on acreage belonging to the Compania Espanola.

Phillips drilled three 10,000-footers in the Anaco area. Ana-3 and Gaucho-1 were abandoned as dry by the end of 1953 while Santa-2 was testing at about the same depth.

Early marine seismograph work was a direct adaptation of techniques used by marsh crews. Operating in a shallow bay of the Gulf of Mexico in 1937, this crew planted heavy seismometers on bottom and drilled shot holes from a small barge which put down legs to support it firmly on the bay floor. Luggers towed the jug boats to and from area of operations. Geophysical Service Inc. photo.

Marine exploration is coming of age

By Curtis H. Johnson and John W. Wilson
Geographical Service, Inc.

IN DECEMBER of 1953, with the sale of leases on 375 tracts of submerged lands off the coast of Texas, it appeared that the "tidelands" gate was open and the long-awaited rush toward exploitation of the controversial United States continental shelf was on.

"There has never been anything like this anywhere in the world," Texas Land Commissioner Bascom Giles said following the bidding for the off-shore tracts. Texas had put on sale rights to 415,790.76 acres, out of which 375 tracts totalling 412,329.9 acres sold for $32,367,819.26. It was one of the largest sales ever made of leases to submerged lands, and Giles further expressed the opinion that the sale would "bring about the greatest development in our offshore land that Texas has ever seen."

That sale not only was one more step toward tapping the 13-billion barrel crude oil reserve estimated to be lying under the floor of the Gulf of Mexico, but it was indicative of a general increase in effort that would take place in exploration and development of oil resources in marine areas. Not only in the Gulf of Mexico, but in other waters over the North American continental shelf and throughout the world, exploration activity seemed destined to take a big upswing.

Marine geophysical exploration already was expanding in 1953, and should the factors which influence offshore activity remain as favorable as they were at the year's end, it seems probable that within the next five to ten years the employment of geophysics at sea will reach heights far exceeding the amount of similar work in the industry's previous history.

After 1947, during the period of disagreement over leasing rights to offshore lands, the offshore exploration programs that had been projected following World War II dwindled and all but expired. But pressure toward marine prospecting in United States waters was merely held in check pending settlement of the states-federal controversy. The need to carry oil prospecting and oil development to sea was still there.

High point of geophysical exploration immediately following World War II reached a total of at least 21 parties. This activity went as far back as 1937 and its extent can be indicated by the following summary of geophysical work off the Louisiana coast from 1944 to 1947:

Reflection seismograph parties and refraction seismograph parties together accomplished six crew-months of work in that area in 1944. The following year the total had risen to 24 crew-months of work for reflection parties and to six crew-

months for refraction parties. In 1946 reflection parties worked 90 crew-months, refraction parties 60, and gravimeter parties entered the picture with 10 crew-months. The following year saw 150 crew-months of reflection work, 80 months of refraction work, and 20 months of gravimeter work. These figures are reported in PETROLEUM DATA BOOK, 1947.

With the renewal of interest following prospective settlement of the tidelands issue, activity was at the following level by the end of 1953: off the Louisiana coast were 11 seismograph parties and three gravimeter parties; off the Texas coast were eight seismograph parties and one gravimeter party; Florida waters had one seismograph party; and the West coast could account for four parties, all of them seismograph. One aerial magnetometer party had worked in the Gulf area during the year.

The increase could be termed moderate except for the brevity of the period of time over which it has taken place and except for the factors which combine to make geophysical prospecting at sea a much more costly and difficult procedure than the same operation carried out on land.

But these factors could be offset partially by others which produced a favorable climate for the continued expansion of marine geophysical exploration.

First of all, the submerged lands now available to oil exploitation constituted perhaps the one remaining area of frontier holding promise of rich production returns. Out of approximately 278,000 square miles of continental shelf lands, only 14,000 square miles under the Gulf of Mexico from the Mississippi westward to the Rio Grande and only 300 square miles off the California coast could be considered promising for drilling under technical limitations of the next five years. Problems encountered in water depths greater than 50 to 60 feet would have to be surmounted before the drill could move farther out from shore, but geophysical parties already were making reconnaissance surveys of areas covered by deeper waters.

Necessity would help to push geophysical work offshore to a wider horizon. In 1953, geophysical activity on land, which had reached an all-time peak the year before, showed a slight decline while offshore work picked up. In a 1953 report to the United States Department of the Interior, "Submerged Lands Productive Capacity," the National Petroleum Council noted a significant factor in the oil companies' need to move offshore in the search for productive structures by saying, "onshore work along the Gulf Coast is reaching the point of diminishing returns . . . ."

With the removal of legal obstacles, an attractive frontier area lies open to the oil companies; leasing difficulties are being resolved and the economic divergences between land and marine work will be reduced, provided "offshore operations are conducted on a large scale and all facilities and equipment are fully utilized" to the point that the NPC can report the possibility of fulfillment of a "goal . . . to develop large reserves of oil and gas at unit costs that are comparable with those on land."

Necessity would further influence the expansion of marine geophysical exploration as oil companies and geophysical contractors gather more experience in water work and push forward refinements to the geophysical methods they employ, both in interpretation and in techniques for gathering data.

Before the advent of World War II, marine geophysical work had almost completed its essentially experimental stage. During and after the war it was in what might be considered a pioneering or developmental period. Now it appears that this second phase is ending. The next decade should see geophysics complete its transition from land to sea and enter into establishment of a third technological stage employing specifically marine procedures and equipment.

Geophysical exploration at sea has a relatively short history within the bounds of a science which has developed princi-

The two-ton diving chamber used in the search for oil in Bahamas waters. Gravity meter is inside the six-foot high chamber. Photo courtesy Standard Oil Co. (N.J.)

pally in the past quarter-century. Paradoxically enough, one of the methods earliest employed in marine prospecting has received least emphasis as offshore programs have developed.

One of the first explorations of a water-covered area was reported in 1934 by C. and M. Schlumberger and E. G. Leonardon in transactions of the American Institute of Mining and Metallurgical Engineers. They discussed a method of electrical exploration for defining the prolongation of an anticlinal fold under the Caspian Sea, adjacent to the oil field of Bibi Eibat near Baku.

"The problem put before electrical prospecting was to determine accurately the remainder of the structure underlying the Caspian Sea," they wrote. "To this end, a triconductor cable (usually employed in electrical coring operations) was resorted to. A system of three electrodes . . . was prepared at the end of the cable . . . The cable, wound up on a winch located on shore, was drawn out and laid down in the sea by means of a motor boat. It was then wound up again slowly on the winch, and electrical readings taken every 15 meters, or even at shorter intervals in the interesting zones."

At the end of the exploration program, with the structure defined, a large area was reclaimed from the sea before the extension of drilling operations.

Gravity work at sea had antedated this combined sea-and-land program, with Dr. F. A. Vening Meinesz, of Holland, the first to perfect a pendulum instrument for making accurate gravity measurements in water-covered areas.

In AIMME transactions, 1940, Albert J. Hoskinson reported: "The first gravity-at-sea work undertaken by the United States was in 1928, when Dr. Meinesz was invited to bring his instrument to this country and make a gravity cruise in a United States submarine . . . The cruise was made in the Gulf of Mexico and in South Atlantic waters in the immediate vicinity of Cuba, Haiti and Puerto Rico . . . Forty-nine stations were occupied on this cruise and some very large and interesting negative anomalies were discovered north of Haiti and Puerto Rico."

A second expedition was organized in 1932, Hoskinson continues, to investigate the water and land area of the Bahama Islands and to determine the western extent of the negative strip of anomalies discovered in 1928. "Fifty three sea stations were occupied, the extent of the western end of the negative anomaly strip was very nicely determined, and gravimetric conditions in the vicinity of the Bahama Islands were carefully analyzed."

Further probing of the ocean floor was made possible in 1934, when C. S. Piggot first used a deep sea coring apparatus for obtaining core samples up to ten feet in length. However, according to W. B. Agocs in *Geophysics*, April 1944, neither the gravity nor the coring method "was a positive means of determining thickness of sediments overlying the basement rocks or the detailed geologic structure, nor could they be used to determine depths and characteristics of sediments beyond the oceanic ooze."

By 1935, seismic methods were being applied to marine exploration problems, when, wrote Agocs, "Ewing started his work on deep sea seismic geophysical investigations. He tested equipment and means of obtaining seismic records in the ocean to (water) depths of three miles."

Pioneering work between the time of these earlier efforts and that of the peak activity before the tidelands shutdown made great advances in giving sea legs to prospecting methods that had begun their careers on dry land. Today, to meet demands for offshore explorations, the geophysical segment of the oil industry has called on all its experience in the earlier phase of marine work. Problems in transportation, in location, in operating procedures at sea, in equipment, and in interpretation show promise of solution.

In the principal geophysical methods employed at sea—the magnetic, the gravity, and the seismic—here is how things stood at the beginning of 1954:

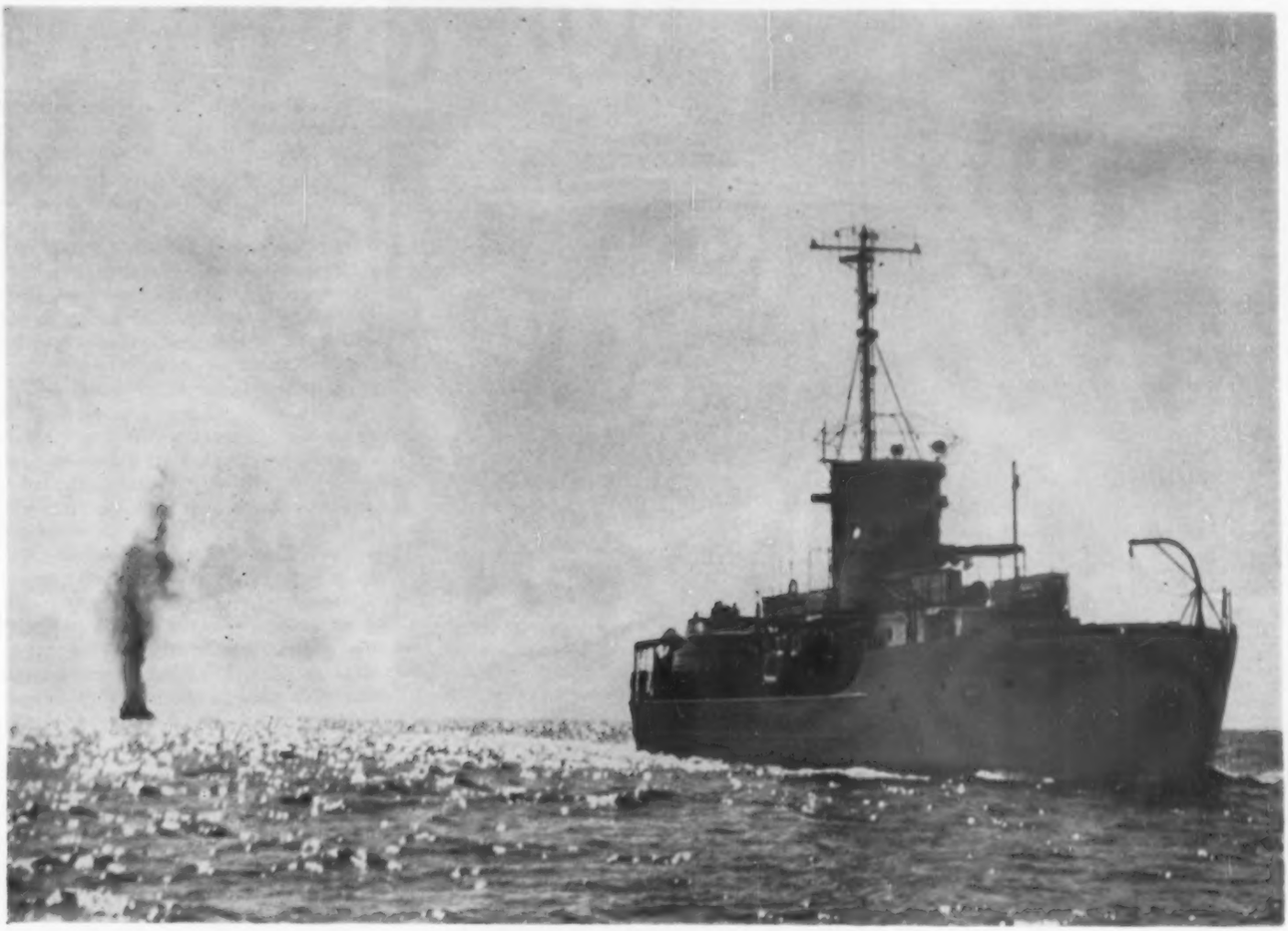
The magnetometer, employed less frequently than the other two methods, was airborne and could be equally useful over land or water.

The gravimeter was still in a more definite stage of transition. In shallow water and under favorable wind, water, and weather conditions, the land gravimeter could be read from tripods resting on bottom. In deeper waters and where the tripod failed to give sufficient stability, a few remote control underwater gravimeters were being employed. The marine gravity pendulum operated in a submarine had been supplemented by the more rapid gravimeter for detailed exploration. The necessity of direct reading had placed the gravimeter in a diving bell which could be lowered to the ocean floor with both instrument and observer enclosed, and the latest development has provided a gravimeter which can be lowered to the bottom of the ocean and read aboard ship.

By the end of World War II a coordinated seismic fleet operation was well developed to conduct surveys in deeper waters. A floating spread such as the one shown here was used in many areas. All photos on these pages courtesy of Geophysical Service, Inc.

Stepped-up offshore exploration activity in 1953 saw the seismic fleet still accounting for most of the geophysical work at sea. Here is a supply boat heading out past a couple of anchored vessels to join elements of its party off the Louisiana coast.

Transition of the marsh-crew technique to the fully sea-going operation for seismic surveys seemed to be virtually complete with success of the single-ship method of geophysical exploration. In this method, surveying, shooting and recording are all accomplished from one vessel as it continues in motion. Its size and facilities enable it to stay at sea for long periods of time and to continue work in all but the heaviest weather.



With new developments in shooting and recording, the seismograph has accustomed itself to boat transportation. Interpretation has sharpened and it was fortunate for marine operations during the past year that the demands for personnel on land crews abated so that the large staffs of skilled interpreters necessary in the fast-moving water work were available. Improved marine cables, some for special purposes, have been developed. Marine crews are working longer hours through the use of larger boats and improved radio-location devices. Crew skill, developed with experience, has contributed greatly to increased production and better quality records. The average multi-boat operation can take a shot on a new profile every three to four minutes and is capable of remaining at sea for 10 days at a time through moderate weather.

Even longer stays at sea are possible with a unique new single-ship operation. Conducted from an ocean-going vessel which can continue work in all but the heaviest storms, this operation employs a pressure-type linear detector and concentrates all shooting, recording, and surveying operations on the one ship. The size of the vessel and the manner of its operation allows shots to be fired and profiles recorded every one-and-a-half to two minutes.

Although the single-ship operation has its limitations, just as any of the geophysical methods currently employed in seeking offshore structures, it illustrates perhaps more than any other development the extent to which geophysics has established itself in a new environment. This method of seismic surveying has itself been progressing through a period of development since about 1949, but by the beginning of this year it was in full swing as a tested and proved example of fully sea-going geophysics.

With the revival of offshore exploration interest, with the opportunity it has to put into practice some of the developments on which it had been working since World War II, and with highly favorable prospects for continued expansion during the next decade, it was apparent at the beginning of 1954 that marine geophysical exploration was definitely coming of age.

In 1953 offshore work, the land-type gravimeter was being employed where shallow waters permitted use of a tripod resting on bottom.

One of many mobile laboratories used for making tests and measurements on present-day complex mud systems.

Chemistry and technology of water-base drilling muds

By W. B. Lilienthal, J. S. McNiel, Jr., and M. D. Nelson

Magnolia Petroleum Company Field Research Laboratories

WHAT CONSTITUTES a drilling fluid? With today's use of gas, air, clear water and sometimes oil, it is necessary to generalize the definition to include any fluid circulated in the hole during drilling. Early in the days of rotary drilling, the driller made his "slush" from the formation cuttings which were drilled up, by judicious use of water, sweat, tobacco juice, and profanity. In many instances these were the only resources available. But the problems of deeper drilling have imposed increasingly stringent requirements on the necessary function of this circulating medium. As a result, the mud engineer has had to delve deeply into the various fields of chemistry and the unit operations of chemical engineering to maintain fluid systems which would permit drilling under diverse geological conditions. Inorganic, colloid, and organic chemistry, as well as the unit operations of fluid flow, filtration, and heat transfer have all become involved in some degree. Developments over the past decade have led to the considerable use of oil-base

fluids and to the application of air and gas drilling where geological conditions permit. However, water-base drilling fluids are by far the most widely used today, and the present discussion will be limited to these so-called "muds."

What is a drilling mud supposed to do? From a practical standpoint, interest in the chemistry of muds is focused on the chemical changes and conditions which determine the ability of a mud to perform its necessary functions in the most economical way.

Probably the most important function of a drilling mud is to remove cuttings from the vicinity of the bit and get them out of the hole. An associated but not entirely comparable function of drilling mud is the elimination of cuttings, sand and occluded gas from the mud at the surface. It is generally accepted that a drilling mud of low viscosity is desirable for performing these functions. Thus, the chemical control of viscosity becomes an important phase of the chemistry of drilling muds.

Other important functions are similar to those performed by cutting oils in machine work and include the removal of heat from cutting surfaces and lubrication of the bit and drill string. Although no satisfactory quantitative measure of the lubricating quality of drilling mud exists at present, the texture or "slipperiness" of the filter cake on the walls of the hole is important for lubricating the drill string. An oil-emulsion mud may have the faculty of making both metal and sand surfaces oil-wet, a condition which conceivably could produce thin-film lubrication at high bearing pressures, operating on the same principle as the highly advertised HD oils.

A further function of a drilling mud is that of maintenance of a fluid-pressure balance in order to avoid excessive flow either into or out of geologic formations during drilling. Often this requires the addition of large quantities of heavy solids, the mineral barite (barium sulfate) being the most commonly used. A high-density mud system may contain three or four times by weight as much solids as water, a condition which requires the maximum in chemical control of viscosity if expensive dilution and re-weighting are to be minimized.

Filtration and plastering properties of drilling muds have received increasingly greater attention in the last few years. It is the function of a mud to deposit rapidly on the walls of the hole a thin and relatively impermeable filter cake to prevent sloughing of unconsolidated formations, to minimize the extent of water entry into potential oil-producing zones, and to avoid tightening of the hole, possibly by swelling shales.

In performing its multitude of functions, it is necessary that the mud resist deterioration of its desirable properties as a result of contamination or by bacterial decomposition of mud components and that its electrical properties be such as to permit obtaining necessary information from electrical logs.

The chemistry of water-base drilling muds is to a large measure identified with the chemistry of clay minerals. The reason for the importance of clays in mud becomes apparent when we take a close look at the solids usually present in mud systems. These solids consist of clay minerals (largely montmorillonite, kaolinite, and illite), quartz and limestone particles of varying sizes, numerous other insoluble minerals, in addition to the barite added to increase mud density. Suppose we could magnify a barrel of mud to a diameter of 1,000 miles. On this scale a water molecule would appear to be about one thirty-second of an inch in diameter. On the same scale, a particle of sodium montmorillonite, one of the most important clay minerals in muds, would appear as an irregular plate nearly as large as this page and about one-eight inch thick. The average barite particle would appear as a much more symmetrical particle equal in volume to a cube with sides about 100 feet long. Silt particles would be represented by a cube 1,000 feet on a side, and sand particles by a cube 1,600 feet on a side. On this same scale, the largest cutting which passes through a shale shaker screen would be represented by a cube approximately two miles on a side.

The above comparison shows the tremendous difference in the shapes and sizes of particles existing in the solid phase of a drilling fluid and suggests one reason for the paramount importance of clays: the large area of exposed surface provided by them in suspension. The surface area of a bentonitic clay (sodium montmorillonite) is approximately 750 square meters per gram as compared to one to 20 square meters per gram for the more nearly spherical barite and silica particles. Another obvious feature bearing on the filtration behavior of drilling muds is the very small size of clay particles.

An important property of clay particles

(Please turn to page 96)

A typical mud surface system, showing settling pit, ditch, shale shaker, and chemical barrel.

TABLE I
ITALIAN AVAILABILITY OF ENERGY ON A PERCENTAGE BASIS

Year	Hydro-Electric Power	Coal & Lignite	Oil	Natural Gas	Wood & Charcoal	Total
1938	38.3	41.3	8.9	0.1	11.4	100
1948	51.3	28.9	11.6	0.5	7.7	100
1952	50.7	23.5	16.6	4.5	4.7	100
1955*	48.9	17.0	17.3	13.4	3.4	100

* Estimate

Italy pushing development of hydrocarbon resources

By Alberto Girelli

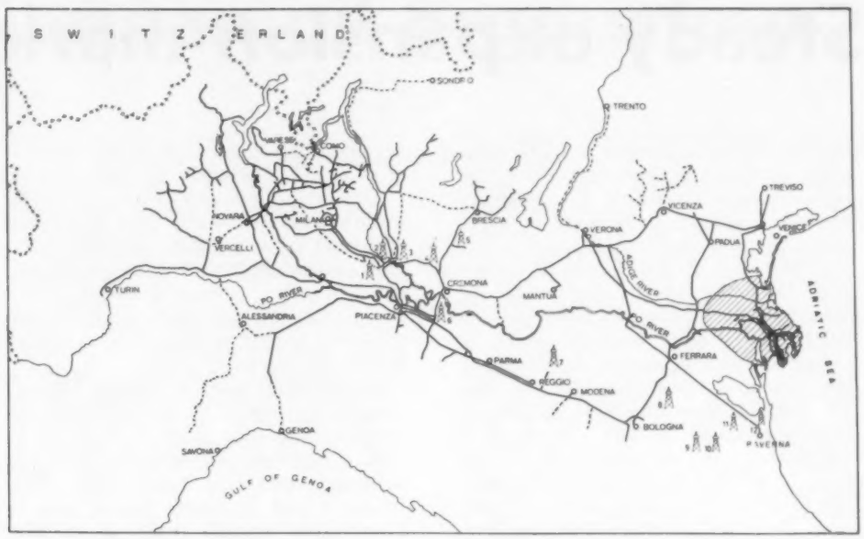
THE NEED FOR greater energy resources is urging Italy to push expansion of domestic production. Demand is increasing at the rate of eight percent per year, and the doubling of present energy of 35 billion kwh available in the country is set as a goal to be reached within the next ten years. In the overall picture of energy sources natural gas and liquid fuels will play a leading role.

Import of crude oil during 1952 for the first time exceeded imports of coal, both on a weight and a Btu basis, and liquid fuel is more and more replacing coal in industrial and domestic heating and for the production of electric energy. Table I shows, on a percentage basis, the availability of energy from different sources in Italy in the years 1938, 1948, 1952 and preliminary estimates for 1955.

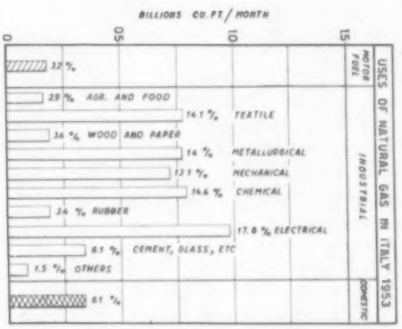
The data reported in the table concern all energy available in Italy, both produced in the country and imported. Within the next two years energy produced by oil and natural gas will represent more than 30 percent of the total energy resources of the country. The increase of oil and natural gas consumption will look still larger on an absolute basis, since the overall available energy is increasing at a yearly rate of about three billion kwh.

Production of crude from domestic fields, though increasing, is still very limited. Production in 1952 was 480,000 barrels and about 770,000 in 1953. Liquids from natural gas (almost completely recovered from the Cortemaggiore field) totaled 420,000 barrels in 1953 against 170,000 in 1952. Recent discoveries of crude oil near Ragusa (Sicily) and near Avellino (South Italy) cannot yet be evaluated quantitatively. The available production of natural gas, substantially increased during the current year by the development operations started in the recently discovered fields in northeastern Italy (Ravenna), could not be distributed internally owing to the shortage of transport facilities. The gas line system in north Italy is being rapidly expanded, and its distributing capacity was about 550 million cubic feet per day at the end of 1953. This capacity will be almost doubled by the end of 1954. Natural gas pipe lines in north Italy have a present mileage of 1,900, and 1,300 miles are under construction or planned. The most important line presently under construction will connect the gas field of Cortemaggiore with Genoa. It is 16 inches in diameter, about 110 miles long, with a transport capacity of 120 million cubic feet per day. The accompanying map shows main producing gas fields and pipe line systems in north Italy.

Exploration for oil, gas and volcanic steams is active in different regions. The government-owned ENI (Ente Nazionale Idrocarburi) is actively exploring the more promising zones of north Italy, while it is pushing exploitation of reservoirs recently discovered. Systematic work is being carried on by ENI and by private companies in central and south Italy and in Sicily. Domestic and foreign companies are particularly active in the latter region. The search for volcanic gases (steam) is also being intensified in the old field of Larderello and in volcanic areas near Naples. Indigenous steam is almost exclusively employed for the production of electric energy. About two billion kwh were produced in this way



Map shows main producing gas fields and pipe line systems in northern Italy.



in 1953, almost double 1949 production.

In Italy the main uses of natural gas are as industrial fuel, as a substitute for coal gas and as a raw material for chemical synthesis.

Industries are the major consumers of natural gas, which has become an invaluable substitute for imported coal. Metallurgical, textile and chemical industries have been leading consumers. The leading Italian chemical company, Montecatini, is operating at Novara the first Italian plant for the chemical utilization of natural gas. The plant, producing 40,000 metric tons of ammonia per year, comprises units for methane conversion, ammonia synthesis, nitric acid and urea synthesis. The first is operating on the Fauser-Montecatini process of incomplete oxidation of methane with an air-oxygen mixture in the presence of steam at 1,740° F over a nickel-magnesia catalyst. The yield of synthesis gas from this process is claimed to be very high (100 cubic feet of methane plus 60 cubic feet of oxygen produce 280 cubic feet of a hydrogen-carbon monoxide mixture containing less than 0.2 percent unreacted methane). Novara plant comprises also a semi-commercial scale unit for acetylene production. Another ammonia plant is being operated by Montecatini near Ferrara, in northeastern Italy. The development of chemical utilization of natural gas is also being studied by Ente Nazionale Idrocarburi. The use of natural gas for the production of thermoelectric power is also being pushed in Italy. The first natural gas power station has been operating since 1952 at Tavazzano, Milan, by Societa Termoelettrica Italiana. A second station has been completed at Piacenza and was dedicated in September 1953 by Societa Edison, the largest Italian electric concern. Other thermoelectric stations, previously operating on imported coal, have been converted to the use of natural gas. With the completion of the Cortemaggiore-Genoa pipe line, another large power station will switch from coal to natural gas.

Natural gas as domestic fuel is limited in Italy to cooking foods. Its extension to domestic and commercial space heating is being studied as this development will noticeably alter the seasonal loads, posing problems which are presenting themselves for the first time in this country, concerning storage, transportation, and interchangeability with other fuels. Natural gas, as such or reformed, is being largely employed by town gas distributors, and is progressively displacing coal gas: 171 gas works for town gas manufacturing and distribution are at present operating. Among them, 11 are distributing natural gas exclusively and 40 others (among them the largest concerns in northern Italy) are distributing natural gas mixed with coal gas.

Use as motor fuel, though increasing, particularly in agricultural regions near producing areas and near pipe lines, is at present a minor use. The main reason for the enduring popularity of this use may be found in the heavy taxation burdening liquid fuels which allows cars and trucks to operate on gas (exempt from taxes) at a sensibly lower cost. The gas is compressed at 2,800 psi and is distributed in cylinders of 40 liters capacity. Trucks, tractors and taxicabs in northern Italy are often gas-driven and 30,000 gas-driven motor vehicles are now operating.

According to OEEC plans for the rehabilitation and the increase of the refining industry in western Europe, Italian refining capacity should have been developed up to 10 million metric tons/year (190,000 b/d) from 1948 to 1953. This figure was supposed to be sufficient to cover the internal demand of Italy and to allow an export of refined products averaging 3.5 million tons/year.

While the OEEC forecasts have been proved to be correct as far as internal consumption was concerned, the expansion of refining capacity has not been limited to the above-mentioned figure. As a matter of fact, Italian crude capacity at the end of 1953 was slightly over 20 million metric tons (380,000 b/d), while new refineries are still under construction or planned, and expansion of existing plants is under way. Only about 40 percent of such capacity will be needed to satisfy the internal demand for finished products. Exports are above the OEEC estimates, but only slightly, so that Italian refineries are working at little over half their capacity. The over-expansion of refining capacity, while beneficial to the consumer, has caused an overproduction crisis which is particularly serious in the field of residual fuel. Overproduction of residual fuel, which represents 45 percent of the processed crude, could be partially overcome by expansion of cracking facilities which is under way. Vis-breaking and coking units are being considered by several refineries. It cannot be foreseen whether this solution will contribute to solving the problem of residual fuel surplus or will only shift the problem toward lighter products. A strongly increased production of gasoline and diesel fuel would present problems connected with car circulation, with highway expansion and modernization, and with government taxation.

Steady expansion marks

By A. M. Stahmer

CRUDE oil production of West Germany, which has been on the upgrade for the past several years, was increased by another 24.6 percent in 1953 with an output of 2,188,716 tons, or above 42,000 barrels daily. Ten new oil and two gas fields were discovered in the past year. The economic importance of some of these fields seems to be small: further exploration, however, has been stimulated in each case.

The new year has set in with two further discoveries early in January. One of them (the wildcat Hankensbuettel 1) probably opens an oil deposit of considerable significance. There is hardly any doubt that the series of successful exploratory wells will be continued in northwest Germany the same as in the Rhine Valley graben of south Germany, and probably also in the Bavarian foothills of the Alps. With regard to its drilling meterage, Germany now ranks fifth or sixth in the world, behind the USA, Venezuela, Canada, the Soviet Union, and possibly Romania. Large investments in geological and geophysical surveys, as well as for drilling, are responsible for relatively high production costs in Germany. These expenses are bound to be reduced with increasing yields. Wirtschaftsverband Erdoelgewinnung has published an estimate according to which the country will have reached an annual output of three million tons by 1957, an amount that probably will suffice to cover one third of the continuously increasing indigenous demand.

The total deep drilling meterage of the German oil companies reached 545,840 (1,774,000 feet) in the past year. About 25 percent of this was due to exploratory wells, 21 percent to extension wells (semi-wildcats) and 52 percent was drilled in shallow test holes. Well completions totaled 461, including 79 wildcats, 83 extension wells, 294 production wells, and five service wells. Fifteen wildcats (19 percent) were successful as were 54 extension wells (65.1 percent) and 275 production wells (93.5 percent), so that altogether three fourths of the deep completions may be regarded as successful.

Apart from some extensions of productive areas in older fields, the main accomplishment was in the Weser-Ems district between the older producing provinces of Hanover and Emsland. In 1953 seven new oil deposits and one gas field were discovered in this area, so that the gap has been closed between Emsland and Hanover.

Previous reports have mentioned the discovery of Molbergen made in January 1953 by the joint interest of Gewerkschaft Brigitta-Deutsche Vacuum Oel AG. Some miles southwest of Molbergen three new oil fields were opened in the course of the year although these seem to be of minor proportions.

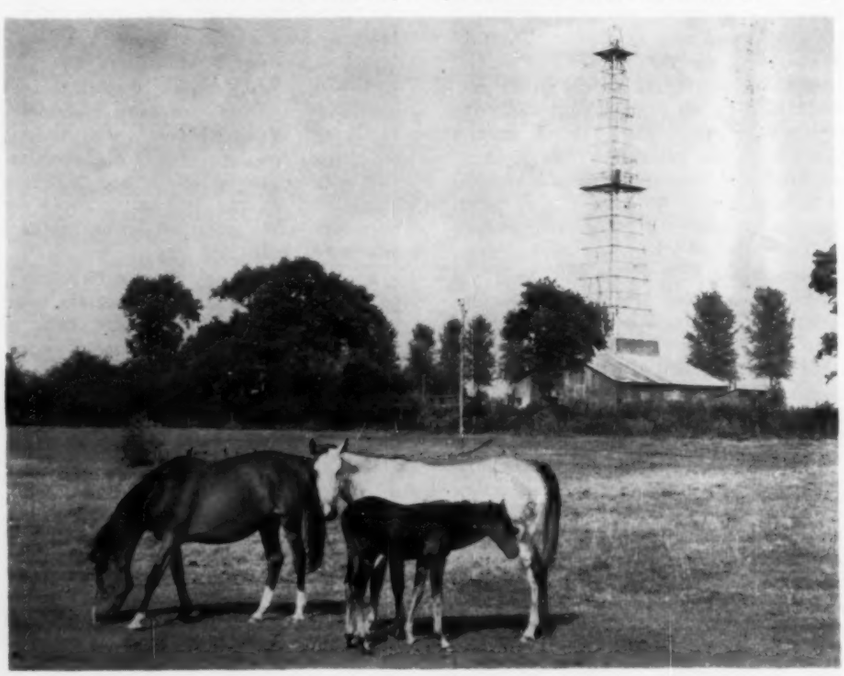
In the area of the Oldenburg concession, belonging to the partnership of Gewerkschaft Brigitta-Deutsche Vacuum Oel AG, two fields were discovered at Liener and Garen on local elevations of the structural trend on which the prolific field of Hemmelte-West had previously been found in 1951. As in other new fields in the oil province of Weser-Ems, Liener and Garen owe their discovery to thorough seismic reflection surveys. Both fields produce from the Kimmeridge (Jurassic), which was encountered at about 800 meters at Liener and at about 1,350 at Garen. A second well at Garen encountered oil in the Wealden (Lower Cretaceous) between 966 and 1,141 meters. The discovery well, Liener 2, flowed an initial daily output of 100 barrels through a 4 mm choke, the quality being nearly the same as that of the Hemmelte crude. Late in 1953 Liener delivered a small monthly production of 117 tons. Both Garen wells, which had been brought in in November 1953 and had yielded several cubic meters of crude on the pump, were shut down temporarily. Further drilling is under way at Garen.

A third new field in the western part of the Weser-Ems district was discovered by C. Deilmann Bergbau GmbH (partnership Deilmann-Gewerkschaft Elwerath) near Ostenwalde seven miles west of Liener in July 1953. The discovery well, Ostenwalde 1, struck the oil impregnated Wealden (Lower Cretaceous) between 1,230 and 1,350 meters. It yielded an initial output of five cubic meters a day on the pump.

Several miles south of the oil field of Aldorf, discovered in 1952, where the monthly production reached about 6,000 tons, Wintershall AG opened a new deposit near Dickel in March 1953. The discovery well, originally named Rehden 7 and later renamed Dickel 1, initially flowed 10 cubic meters of crude per day through a 2 mm choke from the Kimmeridge (Jurassic) at a depth of 1,390 to 1,400 meters. The well has been shut down for the time being to await the results of further drilling before undertaking regular production.

Southeast of the new oil field of Dickel and of the neighboring natural gas deposit of Rehden, a gas reservoir was discovered at Wagenfeld within a joint concession of Wintershall, Gewerkschaft Elwerath, Preussag, and Vacuum. This deposit is bound to an anticlinal structure located two kilometers southeast of Rehden 5. As in Rehden the reservoir rock is the Zechstein at Wagenfeld. The

Derrick in the Ploen oil field of Deutsche Erdoel AG in Holstein, Germany.



German oil production

productive well, Wagenfeld 2, yielded 140,000 cubic meters of gas daily through a 7 mm choke in an intermediate test made before deepening the well at a depth of 2,361 meters.

About halfway between the westernmost Hanoverian oil field at Steimbke and the gas deposits of Rehden and Wagenfeld, the partnership Deutsche Vacuum Oel AG-Gewerkschaft Elwerath succeeded in discovering the fields of Voigtei and Barenburg. Drilling results obtained to date indicate that these fields, which are located in the eastern part of the Weser-Ems province, will yield considerably better production results in the future than the western deposits of Ostenwalde, Liener and Garen.

Drillstem tests in the wildcat Voigtei 1 in March 1953 indicated a good oil impregnation in the lower Kimmeridge and in the upper Cornbrash at a depth of 428 to 470 meters. Late in May the Cornbrash horizon (Jurassic) was opened between 467 and 488 meters and the well flowed seven tons of light crude (specific gravity 0.855) daily through a 3 mm choke. The second well in the new field, located about 1,200 meters east on another block of the saddle-shaped Viogtei structure, indicated the Gigas beds (Jurassic) to be oil-bearing and yielded an initial flow of about 30 cubic meters daily through a 4 mm choke. In the meantime it has been possible to bring in further wells in the Gigas beds. The field already extends over several square miles and delivered 1,612 tons in Dec. 1953.

In Hanover, at the far western flank of a salt structure where exploration had been carried on earlier, the prolific Lehrte field was discovered in 1952. In October 1953 a second find was made on this structure several miles southwest of Lehrte. At a depth of about 600 meters the wildcat Kronsberg 1 of the partnership Gewerkschaft Elwerath - Preussag came in with a daily yield of about nine cubic meters of heavy crude oil (specific gravity 0.896) from the Cornbrash (Jurassic). The oil-bearing layers had at first seemed rather narrow in extent, but an extension well, Kronsberg 2, has proved that two rows of producers can be drilled in them. The outlook is for small production from this field which was the only one discovered in the Hanoverian province in 1953.

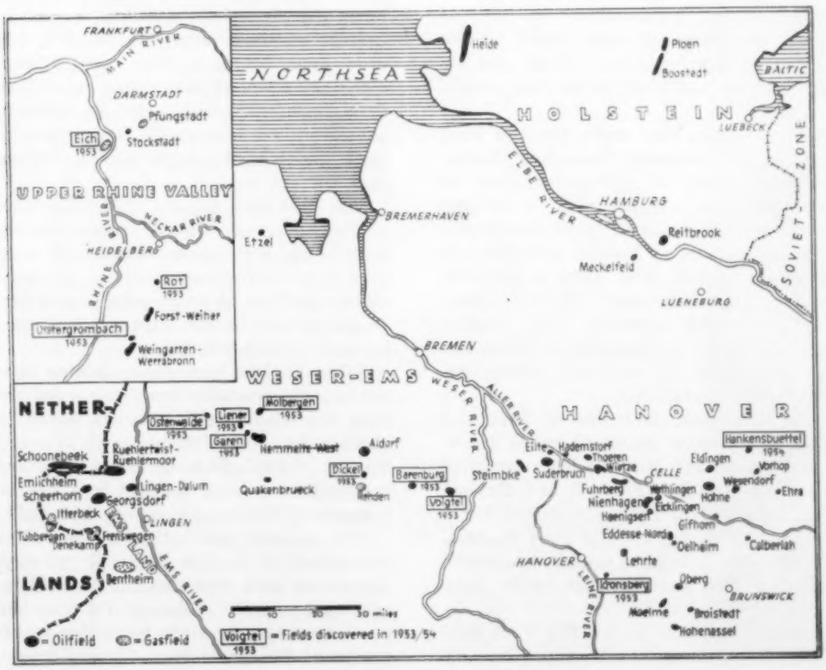
Early in November Preussag announced excellent results from an exploratory well on the western flank of the salt dome of Vorhop. The successful well, Vorhop 6, on a concession jointly owned by Preussag and Gewerkschaft Elwerath, yielded 250 cubic meters of crude of fine quality (specific gravity 0.844) through a 4.5 mm choke from the Dogger Beta. In order to conserve reservoir energy, output was cut down, but there is no doubt that the western flank of the salt dome of Vorhop has a good chance of developing into a prosperous Hanoverian field.

The new year started with a discovery in Hanover which is apparently of great importance. Early in January the joint interest well Hankensbuettel 1 of Deutsche Erdoel AG and Gewerkschaft Morsbruch encountered a porous oil horizon of 25 meters thickness in the Dogger Beta (Jurassic) at a depth of 1,585 to 1,610 meters. The well is located six miles west of the small town of Wittingen at the northeastern edge of the Hanoverian oil area, some miles west of the Soviet zone frontier. For the first time in Germany a deposit of the structural type of a stratigraphic trap has been explored by seismic reflection surveys. The oil-impregnated Dogger sands crop out below the slightly inclined transgression plane of the Alb. Production tests resulted in a flow of about 35 tons of crude through a 3 mm choke, the specific gravity of the crude being 0.858, the viscosity 2.3°E., and the wax content four percent.

In the area of Darmstadt several exploratory wells were drilled near Eich on the left bank of the Rhine, one of which came in as a natural gas producer. Further drilling has been started. Eich is the second gas field in the Darmstadt district. In 1952 Deutsche Erdoel AG had encountered natural gas at Pfungstadt, which is about 12 miles northeast of Eich.

All indications are that crude oil production in Germany will be further increased in the future. At the first stage of exploration in the seventies, the search for oil set in near the seepages of Wietze and Nienhagen. The second period culminated in the early thirties, when efforts were concentrated on the flanks and on the top of the salt domes at that time located by the first widespread geophysical surveys. The third period began when the prolific oil deposits of the Emsland were discovered on saddle-shaped structures of the anticlinal type and when it was proved that oil could be found also on deep structures in the gaps between the salt domes in the Hanoverian province. It is now believed that these deep uplifts are the primary structural elements of the deep subsurface, the salt domes being only secondary in origin. It is possible that a fourth period of oil exploration has now set in in Germany with the discovery of Hankensbuettel and a recent find of gas near Ampfing in Bavaria. In this period the attention of the geologists will in all probability be drawn especially to stratigraphic traps, paleogeographic reservoirs, and perhaps also to oil fields accumulated at faults.

Map of the German oil provinces.



Only about half a day is needed for fracturing a well at Big Foot. The trucks carry Big Foot crude and sand and gel mixture. All photos courtesy Dowell, Inc.

Big Foot—

a field that's different

SIZE IS NOT THE ONLY THING that can give distinction to an oilfield. Some fields are known for their orneriness in refusing to give up the fluid encased in their rocks, some for inexplicable breaks in underlying formations. In fact, as every experienced oil man knows, no two fields are exactly alike. Each has its peculiarities and must be treated accordingly.

Viewed from this angle, the Big Foot field in southwestern Texas has characteristics which, if not unique, are at least unusual. It offers to a drilling crew the rare opportunity of being able to spud in a well on Monday with the certainty that they will have a sure-fire producer by Thursday. It also offers the comfortable certainty that production obtained by regulation drilling can be doubled by a relatively simple recourse to fracturation.

The Big Foot field lies in Frio and Atacosa Counties some 40 miles below San Antonio, and near the little towns of Big Foot, Natalia, Pearsall and Devine. The town of Big Foot was named for a famous Indian fighter, Big Foot Wallace, so-called by the Indians because his tracks indicated that one foot was larger than the other.

Largest operator in the Big Foot field is the Shell Company, with approximately 3,000 acres under lease. Shell at present has 150 wells working which are capable of producing over 100,000 barrels each month. Development is still under way, but the productive limits of the field have been fairly well outlined.

Most of the drilling in the field has been done by a portable, 90-foot rig, especially adapted for drilling in shallow formations. Its drill record is well over a half million feet at Big Foot, through sand and shales which makes drilling easy.

The first step toward this impressive drilling program was a seismic survey in 1947 which generally outlined the prospect. In 1948 core drilling indicated the possibilities of commercial production. In January 1949 the discovery well was brought in at 3,300 feet.

After a slow beginning, drilling was put on an assembly-line basis. As the pace quickened, drilling crews began to average four days for each well. Toward the end of 1951, 74 wells had been drilled and operations were brought to a halt so a survey of field conditions could be made.

The average production at the time was about 11 barrels per well per day. The entire field was yielding 24,000 barrels each month. Blamed for the low production was the tight formation which prevented the crude from flowing freely.

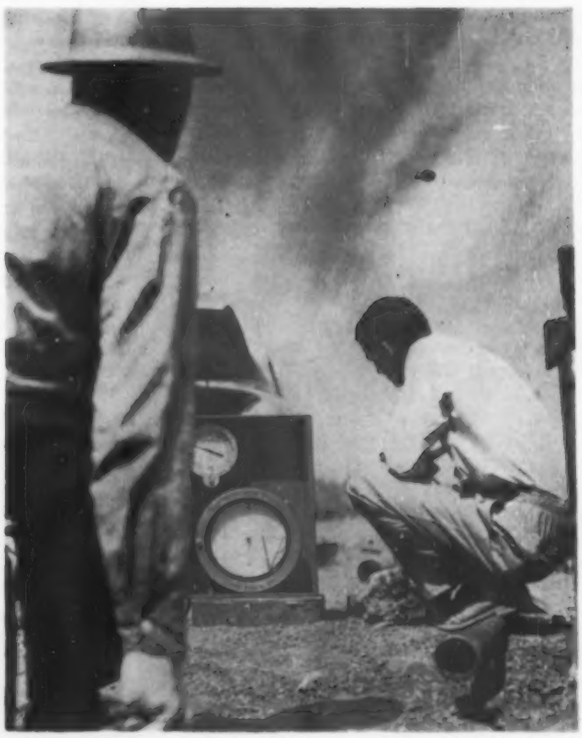
At the well the pumping equipment is connected by means of high pressure pipes to the well tubing. The large hoses are suction connections used to feed the Stratafrac chemical into the high pressure pumps.

Fracturing is done under pressure and all connections in the manifold hook-up must be precise. Here, the tightness of the connections is tested.

So Shell's production men, determined to increase the Big Foot yield, began a six-month study of hydraulic fracturing. The procedure appeared to be custom-made for the Big Foot problem. It involved forcing a gelatin-containing sand into a well under pressure sufficient to break down the formation. This ruptures the rock, opening new fractures and enlarging old ones. Suspended grains of sand are carried into the formation and remain after the gelatin is removed. The sand creates a channel for the passage of fluid and also increases the drainage area of the well.

In May 1952 hydraulic fracturing was tried out on the existing wells and success was apparent from the start. On some wells, the production rate increased by 350 percent. Throughout the field, average production was doubled, and each well currently is averaging about 23 barrels per day. Early last year the field was making 100,000 barrels per month and had become Shell's third largest producer in the Houston area.

The Big Foot field produces from what is known as the Olmos B sand of the Navarro formation of upper Cretaceous age. In some parts of the field the Olmos D3 sand is also productive and likewise has been subjected to hydraulic fracturing with satisfactory results.



As the gel is pumped into the well, this recording instrument tells the story of what is happening 3,200 feet below the earth's surface. In most cases, a gradual pressure increase is shown.

The substance used to fracture the formation resembles a light-colored lime Jello. Sand, carried in suspension, gives the gel a mealy consistency.

Operators have experimented by using different fracturing fluids in different amounts. Some experimentation has also been performed regarding the amounts and particle sizes of silica sands used as propping agents in the fracturing fluids.

Generally, operators have standardized on a system of treatment by which 3,000 to 4,000 gallons of fracturing fluid are injected per well. This fracturing fluid usually will contain from four to five pounds of sand per gallon. In other words, a 4,000-gallon treatment using four pounds of sand per gallon will contain 16,000 pounds of sand.

The prevailing type of sand used is the 20-40 mesh Flint Shot Ottawa type. The sand particles are rounded and this factor seems to reduce bridging in the formation and in perforations where wells are completed through perforated pipe. Some experimentation has been performed using different sand particle sizes, but in general it has not been found that larger or finer sand grain sizes are of particular advantage in this field.

Fracturing fluids used for stimulating wells in the Big Foot field have generally consisted of emulsion type liquids. Most of the wells in this field have been fractured using an acid-kerosine emulsion with the kerosine forming the outer phase. This technique is known as the Stratafrac process and was developed by Dowell, Incorporated. The material has an extraordinary ability to support and carry sand in suspension, is easy to pump through well tubing without undue friction, and is easily removed from the formation without requiring the use of jel breakers or other secondary fluids.

Another fluid which is being used with some degree of success at the present time is a gel formed from the customer's crude oil. Forty gallons of liquid are sufficient to jell 1,000 gallons of crude oil. This technique, known as the Petrofrac process, requires that the oil be jelled at the location and that the propping sand be immediately introduced into the gel prior to pumping the material into the well. Results from wells treated using the Petrofrac process have been comparable to those obtained using the acid-kerosine gel or Stratafrac process.

Service company equipment required to perform these treatments consists of a high volume, high pressure triplex pump powered by either one or two diesel engines. The service company also furnishes one or more 3,000-gallon transports containing paddles which are used to mechanically agitate the sand-gel mixture prior to introduction into the well.

Pressures required to fracture the Navarro formations at Big Foot usually are in the range of 2,000 pounds per square inch where fracturing fluids are pumped down tubing. Pressures at the bottom of the hole of 3,300-foot wells are of the order of 2,000 pounds per square inch. Fracturing pressures at the formation are usually of the order of 0.6 pound/square inch/foot of depth.

Techniques used by the operators in preparing wells for fracturing are relatively simple and uncomplicated. The majority of wells are completed in the open hole. After setting pipe on top of the formation it is usual to drill in the well reverse circulating with crude oil. When the well has been drilled to the desired total depth, the formation face is jetted with crude oil and the material removed by this process circulated from the well. The operator will make sure that the bore hole is free of cuttings or cavings and will then set the well up for completion by running the tubing in the well and setting the Christmas tree. At this point, the service company is called and the treating procedure consists of pumping 25 to 50 barrels of crude oil into the formation, following it immediately with fracturing fluid, and clearing the hole with from 50 to 100 barrels of crude oil. The wells are then shut in from 12 to 24 hours and allowed to flow through a small choke to the tank battery until the pressures stabilize.

Immediately after fracturing, there is a period of flush production which lasts from one to five months. A year after fracturing, wells usually will produce oil at the rate of 30 barrels per day.

Drilling is continuing at Big Foot and there have been no dry holes since the new campaign began. The old wells have all been worked over and fractured and new wells are now hydraulically fractured as part of the completion process.

The hydraulic fracturing procedure has helped turn Big Foot field into an economical producing unit which can now be produced over a shorter period of time than originally estimated.

Progress reported in Iranian oil discussions

ENCOURAGING PROGRESS toward solution of the Iranian oil problem is the burden of reports from Teheran and London during the past few weeks, with an assist from Washington. Considering the apparent hopelessness of the situation up to the time when Dr. Mohammed Mossadegh was removed from power, developments in clearing up the preliminaries to final settlement have moved rapidly and all in the right direction.

First of all, the Zahedi government acted courageously in putting frankly before the Iranian people the desperate straits to which the country had been reduced and the impossibility of restoring its economy without outside assistance. Reiteration of the unvarnished facts, while not overcoming the opposition of the fanatical anti-foreign elements of the population, has brought about a climate more favorable to a reasonable consideration of the oil situation and has strengthened the position of the present government.

Speaking through its foreign minister, Abdullah Entezam, the Zahedi government made known that it would welcome the assistance of technical experts to bring its oil fields and plants back to normal operation.

Resumption of diplomatic relations between the governments of Britain and Iran was an important forward step, permitting direct discussion between the parties directly concerned in closing the breach that had been created. The talks that ensued revealed a desire to arrive at a reasonable and workable agreement that would preserve the rights and serve the interests of both nations.

From the time when the British were expelled and when oil operations in Iran came to a halt, it was the opinion of oil men conversant with international trade that the only practical means of reviving the Iranian industry and restoring the country's product to the world market was through the cooperation of a group representing the international oil industry, including the companies operating in the Middle East, acting with the approval of their respective governments. Since these are the companies serving the markets where Iranian oil would find its natural outlets, they were held to be in the best position to handle Iran's output and gradually reintroduce it to commercial channels without undue disturbance to market stability.

This opinion was strongly reinforced when cooperative action succeeded in closing the gap caused by cessation of the oil flow from Iran and by the closing of the great Abadan refinery together with the failure of Dr. Mossadegh's frantic efforts to find customers even by a drastic slashing of prices.

When this proposal was brought into early discussions, the Iranian government indicated that it would agree to the establishment of a commission of international experts to supervise the rehabilitation of its industry and to act in a broad managerial capacity providing Iranian representation was included. Thereupon, informal meetings were begun in London among representatives of the principal companies operating in the Middle East to consider practical aspects of finding a place for Iranian oil in a world market already amply supplied.

While officials of American companies with Middle East connections participated in these discussions, it was impossible for them to enter into agreements that might affect the quantities of oil to be moved or the terms on which it would be handled without some assurance from the federal government that such action would not be used as grounds for prosecution under the anti-trust act. When this question was presented to Washington, the Department of Justice ruled that participation in a plan to relieve Iran's difficulties was permissible so long as it did not involve manipulation of prices or division of markets. Thereupon, the London conferences were resumed with participation by eight companies including Standard Oil (N. J.), Socony Vacuum, Gulf, Standard Oil Co. of Calif., and Texas comprising the American group, and Royal Dutch/Shell, Anglo-Iranian, and Cie. Francaise des Petroles the European companies with important Middle East interests.

While no announcement has been made regarding these conferences, the understanding is that they are directed toward the formation of a comprehensive plan for utilizing Iranian oil and meeting the emergency needs of the Iran government once a final settlement is agreed upon. As an aid to the committee's deliberations, a delegation of 20 men of technical qualifications was dispatched to Iran to report on conditions there.

Meanwhile the Iranian government has given evidence of its desire for an early settlement by expressing its preference for a determination of the Anglo-Iranian Oil Company's demand of remuneration for seizure of its properties by direct negotiation rather than by the necessarily slow process of arbitration through some outside agency. Its appointment of Torkild Rieber, president of Barber Oil Co., to act as its advisor was recognized as a further step toward treating the whole subject from a practical business viewpoint rather than as a political issue.

An essential factor in any adjustment

(Please turn to page 121)

Technicians representing the consortium of oil companies and Iranian officials visit the Abadan refinery which has been shut down since Anglo-Iranian Oil Co. properties were expropriated nearly three years ago.

Ganzo Azul No. 9, first new producing well drilled in the Amazon Basin. Photo courtesy Ganzo Azul Co.

Peruvian exploration active in 1953

By Dr. J. E. Rassmuss

LIMA, PERU

PERU'S CRUDE PRODUCTION in 1953 amounted to 15,998,943 barrels against 16,403,083 in 1952, a decrease of 2.5 percent. Recovery of natural gasoline yielded 1,049,272 barrels, more or less equal to the previous year. The decline was due principally to the drop from 11,306,588 barrels in 1952 to 10,422,806 in 1953 (in the La Brea-Parinas field of International Petroleum Co.) or nearly eight percent, caused by the natural depletion of the field which has been producing 30 years. An additional factor was the interruption of operations in December caused by a strike at Talara. Yield of natural gasoline in Brea-Parinas was 881,295 barrels in 1953 and LPGas 37,533 barrels.

Development of joint operations with Compania Petrolera Lobitos, which are conducted by International, sharing the output with Lobitos, has become an important factor, having yielded 1,037,571 barrels in the strip of the boundary zone and having increased to 201,505 barrels in the second area located between Lobitos and El Alto field.

Recovery of oil in the Brea-Parinas field is maintained at high levels by efficient measures of secondary recovery. For the Mile-6 pool, discovered in 1934, according to a recent paper of E. L. Anders, Jr., recovery is calculated at 67 percent of the initial oil in place. Recovery gain in the Monte pool, about a mile further south and discovered in 1948, is estimated at 62.9 percent according to Travis (AAPG, September 1953).

Capacity of the refinery at Talara will be increased to 45,000 b/d by installation of a new pipestill at a cost of $4,000,000 in addition to the existing four thermal cracking units. On stream date is to be in September of this year. Talara refinery is now processing all products for domestic consumption of the country, elaborating also the correspondent share of Lobitos. The 1,300 b/d topping plant of Empresa Petrolera Fiscal at Villar is being dismantled and will be transferred to Iquitos in the Amazon basin. Lobitos retains a small topping plant for local use.

Low ceiling prices, established now at 1.50 soles per gallon for ordinary motor spirit in Lima, or about 7½ cents U.S. at the present exchange (against 12 cents U.S. in Venezuela), create a difficult problem for the refiner because, deducting the gasoline tax of almost ⅓ of the price, freight from Talara, distribution expenses and margin of the retailer leaves only 61 cents Peruvian or about three cents U.S. for the producer, according to Max E. Crawford, former operations manager of International at Talara.

Eng. F. Noriega, manager of the government's Empresa Petrolera Fiscal, in a speech before the Military Academy, stated that the margin, when processing the Empresa's crude in the state refinery for sale on the domestic market, amounted to only three soles per barrel (about 25 cents U. S.), while direct export of the crude to Argentina or Uruguay left a profit of 33 soles per barrel ($2.20 U.S.).

As domestic consumption in Peru increases yearly about 10 percent and is estimated for 1953 at around 11.5 million barrels, the exportable surplus diminishes rapidly and profits of the private companies are consequently being reduced. An increase of production by development of new fields in Sechura would reverse these conditions in favor of the producers.

Construction of a new refinery for the Helios Co., (promoted by Argentine-Romanian interests) of 3,000 b/d capacity in the port of Pisco, about 150 miles south of Lima, was authorized by the government on December 21, 1953 and is to be completed in 1955. It is designed especially for the production of paraffin and other by-products for export.

Output of Cia. Petrolera Lobitos' fields, including the joint operation areas, amounted in 1953 to 4,785,907 barrels against 4,522,201 in the preceding year, an increase of about five percent. Yield of the fields of Lobitos and El Alto, including part of Organos, was 3,546,831 barrels. Production of natural gasoline of both fields gave 167,977 barrels. Principal production of the Lobitos field comes from the Parinas formation at around 4,000 feet depth. The deep sands in the 6,000-7,000 foot range have given favorable results.

Lobitos Co. concluded last year an operating agreement with Douglas Oil Co. of California for the development of an

offshore strip of around 1,000 acres included in its concessions. The first offshore well, spudded by Douglas in November by inclined drilling from the coast, was drilling at the end of January at a depth of around 4,600 feet, having struck three oil shows. A second rig, provided by Lobitos Co., will speed up drilling.

Empresa Petrolera Fiscal, the government's enterprise, increased its production to 590.103 barrels in 1953 against 374,249 in 1952, or 56 percent. A total of 67,577 feet was drilled. Besides the principal Organos field, the depleted Zorritos field, where the first oil was found in 1863, and the small new pools of Caripitas and Punta Bravo, a new area called Sector Peru has been opened in the southwestern part of the concession, neighboring the above-mentioned boundary strip of Lobitos fields operated by International. Already two producing wells have been completed. Development drilling in this area is carried out by Santa Fe Drilling Co. An earlier drilling contract with Dunlap & Graham has been cancelled. Empresa has acquired a new Ideco H-30 rig, which has been in operation since December. Production in 1953 was divided among the company's fields as follows:

Zorritos incl. Cope	16,018	barrels
Organos (Conc. Patria)	566,040	"
Caripitas and Pta. Bravo	4,877	"
Sector Peru	3,168	"

Empresa ceded from its concession area (totalling 870,000 hectares) different areas to two foreign companies for development. An extension of about 300,000 acres, located in the southwestern part and in the north in the Tumbes region, was granted to Peruvian Pacific Petroleum Co., subsidiary of Cities Service Co. operated by Richfield Oil Corp. The first well, located in the southwestern area east of El Alto field, will be spudded in February 1954.

Two other areas of about 180,000 acres in total, located one in the middle part of Empresa's concession and comprising the Caripitas pool and the other in the southern part, have been granted to the new Petrolera Amotape Co., promoted by North American capital.

Export of Empresa's crude will be confined to Argentina and the new barter agreement for meat with Argentina establishes a supply of a million barrels of crude yearly, which will be provided by Empresa's output and the government royalty from Lobitos Co.

In Sechura, where 12 oil companies have acquired concessions totaling four million acres, exploration is progressing. One new major company, Texas Petroleum Co., subsidiary of Texas Co., has entered Sechura recently by acquiring the concessions of two companies: Peruvian Oil Concessions Inc. and Cia. Sud American de Petrolero, both founded by Argentine interests.

Coexistence of four national companies offers, according to the opinion of Eng. Noriega, Director de Petrolero of the government, the best guaranty for oil investments in Peru, because by mutual cooperation a sound foundation and a common interest for a successful development of the oil resources of the country is created, different from other countries where exclusively foreign companies are operating, and where, when any reverse of the oil industry by the decline of production or a drop in prices and consequent reduction of government revenues occurs, it may be blamed on the foreign companies.

Following extensive geophysical surveys, drilling has started in Sechura. The first well of International Petroleum Co., Viru 4-X 1, located south of Paita and about four miles from the coast, was spudded in August. Drilling was carried out by Santa Fe Drilling Co. with a National 130 rig. The drill encountered the Tertiary sequence down to the Verdun, the lowest upper Eocene member, and at 4,500 feet entered the Cretaceous. At a depth of 7,330 feet, basement was touched and the well had to be abandoned.

Richmond Oil Company's first wildcat, located in the southern Sechura desert near Alto de Cabo Verde about 55 miles southeast of Bayovar and drilled by Loffland Brothers of Tulsa as contractors, had attained a depth of around 5,600 feet at the end of January without oil shows.

The third wildcat, spudded in January by Union Oil Co. and Petroleo Sullana northeast of Colan, a beach north of Paita, reached basement rocks at 1,282 feet and was abandoned. This result was unexpected, as the previous geophysical surveys had indicated a favorable Tertiary structure, in reality an elevation of the basement.

First results of drilling in Sechura have been disappointing, but geological and geophysical surveys offer ample prospects of finding oil, though intense drilling will be required for its proof.

A fourth wildcat was spudded in February by Peruvian Pacific Petroleum Co. farther north in Empresa Petrolero Fiscal's area.

On the continental shelf drilling has been started by Douglas Oil Co. in Lobitos bay and some production is expected in the first well. A new national company, Petrolera del Pacifico, has obtained 47,192 hectares or around 117,000 acres of concessions on the shelf opposite the Lobitos and Cabo Blanco coast. Development will be handled by Douglas Oil Co.

In eastern Peru, in the Montana, production of Ganso Azul field amounted in 1953 to 200,127 barrels, approximately the same as the preceding year. Three new wells have been drilled in the past few months by the new company to a depth of around 1,200-1,500 feet. Two of the wells, 9 and 10, were producing, while Number 11, located about one kilometer to the west, touched the edgewater. Drilling will be renewed after the rainy season. Production has been increased at present to about 1,000 b/d, but is restricted by difficulties of transport. The company has applied lately for more concessions adjoining its former area and has increased its holdings in other parts of the Ucayali basin by around 250,000 acres.

The national Cia. de Petroleo El Oriente, which augmented its capital to 30 million soles ($2,000,000) and has spent about a million dollars in exploration in the Montana drilling three wildcats in the Contamana Mts. and on the Pisqui River, all of them dry, proposes to drill a new well east of Contamana on an anticline of the tertiary Red Beds near the seepages of Cashiboya. The company holds around 1,900,000 acres of concessions.

Interest in the Montana has been lively during the past year, with concessions being applied for on a total area of 6,611,168 hectares, or about 16.5 million acres at the end of the year. Five companies have taken almost a million hectares each:

Texas Petroleum Co.	999,988	hectares
Socony Vacuum	852,755	"
Richmond Oil Co.	999,991	"
Peruvian Pacific (Cities Service)	956,550	"
Petroleo Sullana (Union Oil, operator)	983,548	"
Peruvian Oils & Minerals (Canadian)	728,576	"
Cia. Peruana El Oriente	778,448	"
Petrolera Peruana	204,747	"
Ganso Azul Co.	106,563	"

Most of the concessions are concentrated in the northern area on the Maranon river and its affluents, where the projected pipe line from Borja on the upper Maranon river to Bayovar on the Sechura coast offers an appropriate outlet to the Pacific coast.

A recent paper by H. J. Tschopp, former manager of Shell of Ecuador, in the November issue of AAPG gives an excellent description of the geological conditions in eastern Ecuador, where the six wells drilled by Shell and Standard (N.J.) found only residues of former oil impregnation, flushed by intermediate erosional periods, due possibly to the vicinity of the Brazilian Shield, which reaches to the Napo river. However, toward the south, as indicated also by the seismic map, depth of the sedimentary basin seems to increase and the sedimentary sequence is further developed. The lower Cretaceous sandstones, which in eastern Ecuador have shown only stains and rests of heavy oil washed out by subsequent denudation, in Ganso Azul field contain rich oil sands and silts of high grade oil reaching 160-170 feet in thickness. Not only the Cretaceous deposits, but also the underlying Jurassic and Permian marine formations offer new prospects in eastern Peru.

Progress of exploration in the jungle covered country will require time and heavy expense and start of drilling cannot be expected before two years except in some areas, such as the Sacramento structure west of Ganso Azul.

Derrick barge for offshore service

WITH THE DEVELOPMENT of marine exploration and drilling, new and specialized equipment adapted to the particular requirements of offshore operations has been designed and brought into use. In the offshore search for oil independent bases must be established and maintained. Structures must be built capable of resisting terrific winds and the titanic blows of towering waves whipped up by hurricanes. Commodious quarters must be provided for crews that may be isolated for days or even weeks at a time. The movement of machinery, pipe and materials of all kinds calls for substantial craft with capacity for heavy loads and able to navigate under all sorts of conditions.

In the waters of the Gulf of Mexico off the shores of Louisiana and Texas and in the borderland that is neither sea nor solid ground, the lowly barge has become the workhorse of the oil industry. Sometimes it serves, submerged or afloat, as foundation for heavy drilling rigs; anchored alongside a drilling platform in the open Gulf, it sometimes provides living quarters for workers; and at all times it transports back and forth the tons of materials and supplies required for offshore drilling.

The carrier designated as Derrick Barge No. 7, recently completed by Avondale Marine Ways at Harvey, La. for J. Ray McDermott and Co., represents the latest type of advanced design in this field of petroleum operation. It is the largest of its kind ever built and the most powerfully equipped. It carries a completely revolving derrick which is the largest ever installed by American Hoist and Derrick Co. who are specialists in this field. From end to end the barge is 300 feet in length, occupying the space of a full city block. It is 90 feet wide and has a depth of 19 feet. Its main boom has a length of 200 feet and can travel through the full circumference of 360 degrees. The main hoist has a lifting capacity of 500,000 pounds with a radius of 50 to 80 feet, and is provided with 4,200 feet of 1⅛-inch cable. The auxiliary fall has a capacity of 100,000 pounds at 60 foot to 90 foot radius, requiring 1,050 feet of cable and jib. It can handle a load of 40,000 pounds over a radius of 70 to 100 feet using 700 feet of cable.

The main boom hoist has 24 sections of 1½-inch cable operated by a series D-600 engine and 3,600 feet of cable. The five deck winches are each equipped with 1,500 feet of 1¼-inch cable, making a total cable length of 17,050 feet or nearly 3¼ miles.

Working equipment of the barge in addition to the 250-ton derrick and the winches of single drum and twin-drum type includes boilers developing 500,000 Btu, 100 kw generator, electric and steam operated compressors, a distillation unit, fuel oil storage tanks with a capacity of 4,000 barrels and a wide range of pumping machinery including steam and electric pumps, centrifugal pumps, bilge pumps and fuel oil transfer pumps.

The barge will carry a crew of 56 men including the captain. Comfortable and commodious quarters are provided for the crew. Tiled floors make it easy to keep the decks and rooms clean. Refrigeration keeps supplies in good condition. A "weathermaker" air conditioning system maintains comfortable temperatures in the quarters. Television and radio supply entertainment during leisure hours in the periods spent offshore.

Construction of the barge required approximately 2,000 tons of steel and over 40 tons of welding rod. All the work was performed in accordance with the requirements of the American Bureau of Shipping, the United States Coast Guard and the United States Public Health Service to insure the safety and comfort of the personnel. Altogether, "McDermott Derrick Barge No. 7" represents the acme of progress in its highly utilitarian field not only in size, but in the completeness of its equipment and in careful provision for its working force.

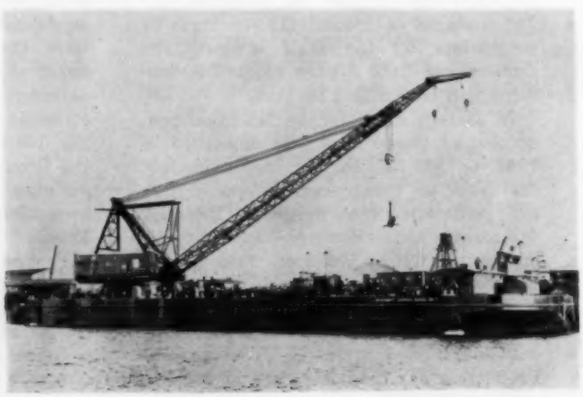
The McDermott Company, owner of the big barge, is engaged almost exclusively in rendering construction service to oil and gas companies. Derrick 7 was planned and built in anticipation of greatly increased drilling activity in the Gulf of Mexico. It is not intended to be used as a base for actual drilling, but for the building of drilling platforms and for the setting of drilling equipment on foundations. It can pick up, transport and place in position substructures or entire derricks with all the component parts of drilling equipment such as draw works, engines and mud pumps.

Having been built for use throughout the areas where marine exploration and drilling is likely to be carried on, Derrick 7 can operate in depths ranging from seven or eight feet to 200 to 300 feet. Its average operating draft is intended to be approximately ten feet, but this can be increased or decreased by varying the load of fresh water ballast it carries. It has a water capacity of over a million gallons, but will operate normally with a load of about 800,000 gallons. Its fuel tanks will hold 170,000 gallons of diesel oil and when it started on its first voyage a few weeks ago, it carried a fuel load of 150,000 gallons.

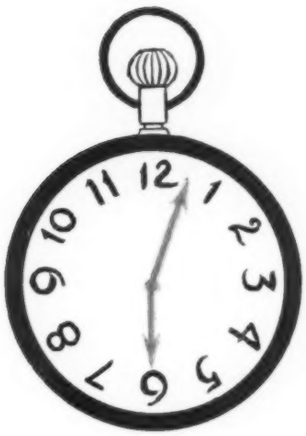
The evolution of this particular barge is just one more example of the specialized equipment that is being brought into existence to aid in the recovery of oil from what is perhaps the most important petroleum province remaining to be occupied.

Base of full-revolver derrick.

Outboard profile of barge showing 200-foot boom.



View of 300 by 90-foot deck of derrick barge.



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"Why did we select Houdriflow? That's a fair question and I'll try to answer it, but first I want to make a point of my own. That point is this: we went on-stream in September of last year. Since then our operating experience has been everything we'd hoped for. So you see, we're mighty satisfied with the new Houdriflow unit.

"Our new Houdriflow cracker replaces an original Houdry Fixed Bed Unit. That plant served its purpose very satisfactorily for many years, but our expansion program required greater versatility and capacity.

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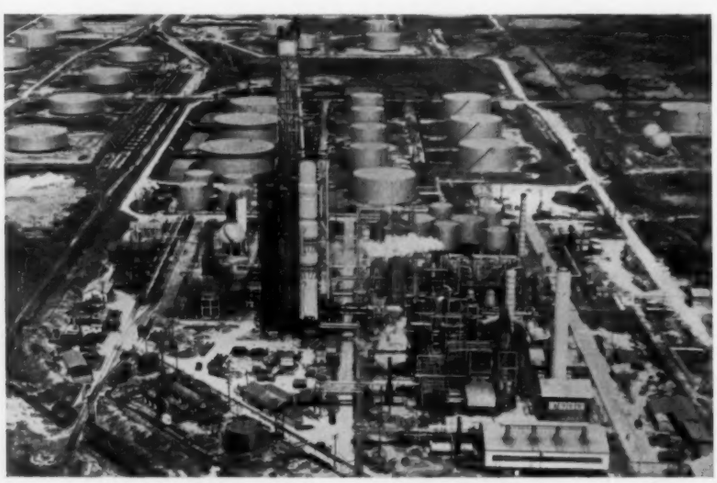

●

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PIONEER IN CATALYTIC PROCESSES

Plans for Spanish military bases are placed before Congress

WASHINGTON

UNITED STATES military authorities planning the construction of a 600-mile petroleum products pipe line in Spain are preparing to start work this summer and finish up within the next two years.

The line, which would run north and south through the heart of the Iberian peninsula, is a $41 million part of an overall $300 million American investment proposed for military bases in Spain.

Explaining the pipe line, Major General Lee B. Washbourne, director of installations of the Department of the Air Force, told the House Appropriations Committee:

"The construction of the POL pipe line and storage system in Spain is necessary because none exists in the country at the present time, and it is the only practical means of handling fuel in the required volume and storing it safely for long periods.

The only alternatives to a pipe line, the railroads and highways from the Cadiz area to Madrid, are completely inadequate to handle the tonnage to be moved without stopping everything else, the committee was told.

Particulars of the pipe line and the series of bases put before the committee are the first concrete results to come to light from the agreement of September 1953 between the United States and Spain on bases in the European country.

Under that agreement, as disclosed, Spain gives the use of some land for 10 years to the United States military forces. In turn, the United States proposes the construction of four air bases and seven naval bases, the construction to be of a permanent type. Some 80 percent of the cost is represented by the air base part, with the Navy needing only $60 million for its bases. After 10 years, the contract may be renewed if both nations agree.

The pipe line cost is put at $25 million, while another $16 million, more or less, is to be spent for storage of two types. One would be underground storage in 13,500 and 20,000-barrel tanks at air bases. The other type would be larger bulk terminals, both under and above ground.

The starting point of the line is to be at Cadiz, a port on the Atlantic just west of the Straits of Gibraltar. The line, of 12-inch diameter, will run 74 miles northward to Seville; continue as a 10-inch line for 190 miles to Cuidad Real; then for 111 miles further to Madrid and for 200 miles more to Zaragoza. A 30-mile lateral will extend from Seville to Moron in the south.

Served by the line will be four air bases as follows:

Torrejon, near Madrid, which is estimated to cost $43 million all told. This is now the site of the "Wright Field of Spain," and the United States plans to enlarge it from 900 acres to 3,000 and add runways, buildings, fuel storage and the like. This is the largest air base the United States plans in Spain, and promises to be the most active.

El Copero, about five miles south of Seville, where $31 million is to be spent building an air base on the bare plain.

Moron, 30 miles southeast of Seville, where $12 to $14 million is to be spent building up the present small Spanish training base for American use.

Zaragoza, in the northeastern district on the Ebro River: a total of $31.5 million is planned to add to a partly constructed air field, which is part of the San Jurgo civil air field.

The naval bases, in addition, include one large one and six smaller ones, with the sites yet to be announced. There is speculation that the largest will be at or near Cadiz, a location which would be a good watching post over the Straits of Gibraltar as well as the mouth of the new pipe line.

United States authorities in February named three prime contractors to handle the overall project. These are Brown and Root, Inc., Houston; Raymond Concrete Pile Co., New York; and Walsh Construction Co., New York.

The architectural and engineering work now being completed was let out in a joint venture to four companies last October. The firms are Shaw, Metz and Delio, Chicago; Metcalf and Eddy, Boston; Frederick R. Harris, New York; and Pereira and Luckman, Los Angeles.

United States authorities say that much of the actual construction will be done by Spanish contractors and sub-contractors, with the prime contractors having overall responsibility. A total of 400 Americans at work on the project may be the maximum, authorities said.

In asking for funds for the project, which are coming from Congress, officials said that carrying aviation gasoline and other products by pipe would cost $24 million, against railroad charges of $40 million, and highway transport of $50 to $80 million.

The Spanish pipe line is only one of several petroleum pipe line projects of United States military authorities. A $30 million line is being laid for the Air Force from Juneau, Alaska, northward about 600 miles to Fairbanks, Alaska. Another is being laid in France, from the Atlantic to bases in the northeast. A third line was recently constructed in French Morocco. In fact, some of the line for the Spanish carrier, it is explained, may come from surplus 10-inch pipe supplied for the Moroccan job.

A total of four pump stations at the start are planned for the Spanish project, but the number ultimately may reach 16 or more, it is said.

The establishment of military bases in Spain, opening a new chapter in relations with that country, is exciting lively interest and Congress undoubtedly will approve the appropriation for the purpose. One clause of the proposed agreement, the 10-year limit on use of the facilities, has raised some questions, although it is expected that the time could be extended if necessary. It is pointed out that the first three years of the period will be used in building the facilities themselves. It is suggested that, in the event the cold war comes to an end, the bases might be little used. In that case the pipe line could be turned over to Spain for commercial transport of petroleum products. This could be one of the lasting benefits of the line to the Spanish people and the economy of that nation.

Oil detection by scintillation counters

By George Hare

Precision Radiation Instruments, Inc.

BY MAKING SUFFICIENTLY accurate measurements of the radioactivity of the rocks and soil over oil fields it is possible to determine the extent of the pools below. Radioactivity surveys for this purpose have been employed for many years. In Fort Bend County, Texas, in 1939, a survey of radioactivity of the area about a new discovery well clearly indicated the dimensions of the oil pool as proved by drilling in the following several years. Surveys run in Pott County, Oklahoma, in 1942 showed well-developed "haloes" of radioactivity, marking only those structures that contained oil. In 1944, radioactivity surveys in Cowely County, Kansas, were used to show the direction and extent of shoestring oil sands.

Many such examples have been published in the past ten years and several patents concerning methods and equipment for radioactivity surveying have been granted. Recently it has been found that not only oil, but ores of numerous metals such as zinc, lead, silver, copper, and tungsten yield characteristic patterns of radioactivity.

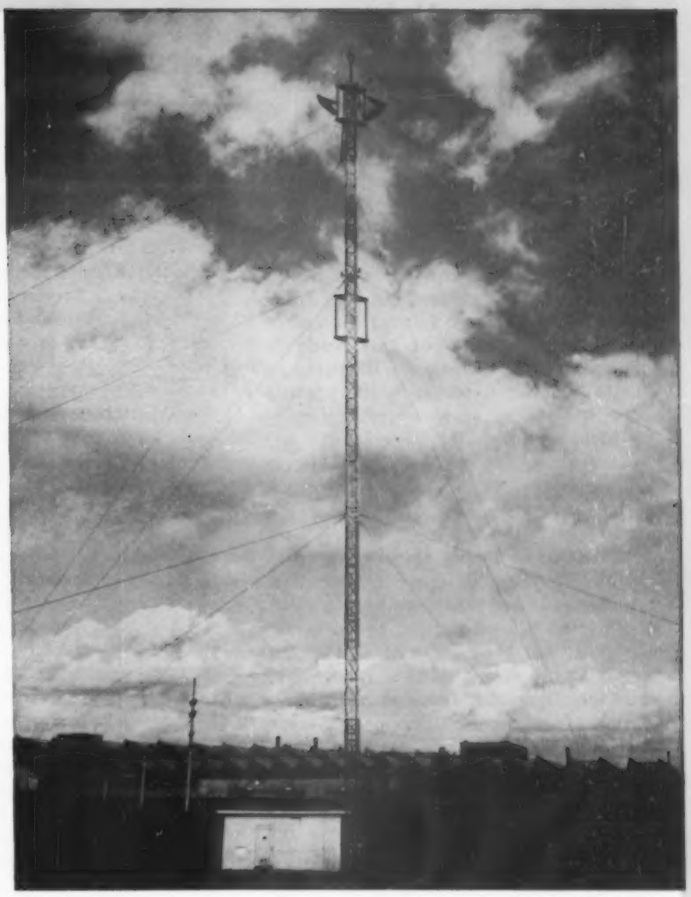
Virtually all rocks and soils are radioactive in some degree. The radioactive rays they emit are of three types: alpha, beta and gamma. All three types have been used for radioactivity surveys. When making surveys it is always necessary to insure that the measurements are not rendered inaccurate due to cosmic rays which are always present and which tend to interfere with radioactivity measurements. This can only be done by counting a large enough number of rays so that the resulting figures will give reliable averages and so that the part due to cosmic rays is essentially constant in all readings. The greater the number of rays counted in a given time, the greater the accuracy of the measurement. It is therefore most desirable to count the gamma rays, since they are emitted by soil and rock in quantities about 100 times as great as are alpha and beta rays. Until recently, however, the only methods available for detecting gamma rays were less than a hundredth part as efficient as those for alpha and beta rays. Because of these factors, field measurements of radioactivity were time-consuming and subject to considerable influence from cosmic rays.

Because of the difficulty of using classical methods for the measurement of the earth's radioactivity, early oil surveys were made by a relatively small number of persons who were skilled in the art. Typically, they used electroscopes which were filled with samples of air or gas taken from a few feet beneath the ground. The rate of discharge of the electroscope was taken as a measure of the alpha ray activity and a single accurate measurement frequently took an hour to make. Special super-large geiger tubes have been used to measure the beta and gamma ray activity. Such tubes were often over three feet long and were generally buried in the soil to obtain the best readings. Measurements made with these geiger tubes were relatively fast, but unless a large array of the tubes was used to obtain a high total counting rate, there was no hope of making the measurements rapidly enough so that any large area of ground could be covered in a day. Although equipment such as this was bulky and delicate, it has served well to show that the boundaries of oil fields are marked by very small but real increases in radioactivity as compared with neighboring areas. The distribution of radioactivity is not determined solely by the location of oil, but is about equally influenced by the existence of faults, bodies of water, soil composition and other factors. Thus, to gain the most reliable information from radioactivity surveys, it is important to interpret the pattern of observed radioactivity in conjunction with all other available geological information about the area. By so considering the results of several types of surveys, the addition of radioactivity measurements has made the delineation of oil fields almost an exact science. Because of the relations between oil traps, faults and the distribution of radioactivity, scintillation surveys are now considered by modern oil prospectors to be the most valuable of all prospecting aids.

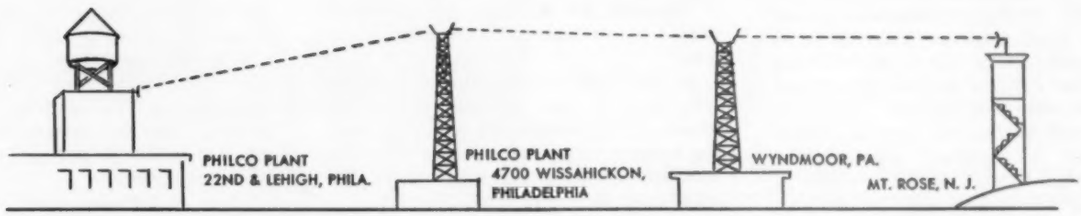
The modern scintillation counter provides a highly efficient method for detecting gamma rays. Scintillation counting is simply the process of observing or counting the minute flashes of light produced each time a gamma ray is absorbed by a special phosphorescent crystal. Such phosphorescent crystals, if well designed, will stop more than 50 percent of the gamma rays striking them as compared to one half of one percent for a geiger counter. This is the reason for their high efficiency as gamma ray detectors. Like all other radioactivity detectors, scintillation crystals are very efficient detectors of cosmic rays. However, since they are also efficient in detecting the much more numerous gamma rays, the measurements of the earth's radioactivity by means of scintillation counting is to a considerable extent independent of cosmic ray activity. Measurements of radioactivity that required hours with equipment now obsolete can now be done in minutes or seconds with a scintillation counter.

Scintillation counters specifically intended for oil field surveying are now commercially available. Typical of these instruments is the Royal Scintillator developed by Precision Radiation Instruments and designed to detect extremely small variations in gamma ray activity so that contour maps of high accuracy may be drawn. The instruments should be constructed so as to permit either direct reading of field intensity (for service in trucks or aircraft) or integrated reading of intensity to be made over some specified time such as one minute for the highest possible accuracy at fixed points.

PHILCO "PROVING GROUND" FOR MICROWAVE



Philco 160-foot microwave tower at 4700 Wissahickon ... one of four similar Philco test sites in the Philadelphia area.



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Drilling Muds

(Continued from page 79)

that is not so obvious, and is often misunderstood, is the effect of their lack of symmetry on the viscosities of drilling muds. Einstein derived an equation for the viscosity of a dilute suspension of uniform spherical particles, which surprisingly implied that viscosity for this system was not dependent on either the size of the spheres or the number of spheres in a given volume, but was determined solely by their volume concentration. Later extension of this work to suspensions of non-spherical particles illustrated the importance of particle shape, a high degree of asymmetry causing high viscosity.

Clays were, until recently, thought to be amorphous (non-crystalline) materials of indefinite composition, but the improved instrumental methods of analytical chemistry have shown them to be true crystals. They are composed of very flat, thin sheets. If one visualizes such a sheet as a sandwich, each slice of bread would be represented by a layer of silicon and oxygen atoms in a definite arrangement, while the filling of the sandwich would be a layer of aluminum, oxygen, and magnesium atoms. Since the sandwich carries an excess of negative electrical charges, positive ions, such as sodium, calcium, or hydrogen may attach themselves to these faces.

These montmorillonite (or bentonite) clays are named on the basis of the atoms attached to the surface: sodium montmorillonite, calcium montmorillonite and so forth. These clays are referred to as base-exchange clays, since the attached atoms ionize in water and may be replaced readily by other positive ions.

Since each surface of the clay crystal or platelet is negatively charged, the platelets tend to align water molecules in an orderly manner adjacent to the surface. This water is held tightly in place, and may amount to as much as 10 times the volume of the clay platelet alone. This effect accounts for the gelatinous, sticky nature of bentonite clays when placed in water.

The above description has been of a single clay platelet. Actually the sandwich structure is repeated in the nature of a stack of sandwiches, or, more properly, like a deck of playing cards. When the clay is placed in water, some of the water molecules are absorbed between the layers (playing cards), forcing the individual layers farther apart. The separation of layers is at a minimum when the water contains high concentrations of dissolved salts. In distilled or fresh water the separation of layers may be complete, with individual layers becoming separate particles.

As noted previously, the surfaces of the clay platelets, separate or multiple-layered, are negatively charged and, therefore, tend to repel each other, assuming a somewhat ordered arrangement with each platelet as far from its neighbor as possible. In addition to the repulsive forces on the faces of the platelets, both positive and negative charges exist on the broken edges of the platelets.

Every water-base drilling mud contains ions in its liquid phase, and these ions exert a profound influence on the state of clays in the system. A pure montmorillonite in distilled water has no gel properties, since there is no tendency for attraction between platelets or for any type of structural linkage between clay particles. When an electrolyte is present, however, positive ions tend to blanket the negatively charged clay platelets, attractive forces come into play, and loose aggregates are formed. These aggregates consist of two or more platelets with flat faces paralleling each other. As the repulsive electrostatic field between particles is compressed, the thickness of the immobile water layer is reduced.

There appear to be two possible sources of gel strength or structure in a clay-water drilling mud. One is a mechanical interlocking of aggregates in a sort of dovetail effect, induced by sudden reduction in repulsive forces caused by rapid increase in electrolyte concentration. This physical condition is roughly analogous to the first motion in shuffling a deck of playing cards. A second, and probably more lasting source of structure, is by edge-to-edge attraction of both platelets and aggregates. The edge-to-edge structure is most important when the liquid contains only small amounts of electrolytes, and probably accounts for the high gel strengths caused by contamination of fresh-water muds.

At very high concentrations of electrolyte, such as salt, the clay aggregates have a greatly compressed structure, spacing between clay platelets being about the same as the thickness of the platelets. The small clusters tend to group themselves in large aggregates that move as individual particles. This condition corresponds to a completely flocculated mud system and represents the state of bentonitic-type clays in salt-water or in calcium-base muds. Unless clay concentration is high, there may be an insufficient concentration of aggregates to form structural networks at these high electrolyte concentrations.

A drilling mud is basically a suspension of solid particles in a liquid, usually water. The concentration of solid particles may range from a minimum, where the "mud" is merely muddy water, to maximum concentrations which may exceed 40 percent of the total slurry volume. Even at relatively low concentrations, such slurries may be too viscous for use as drilling fluids unless treated to increase fluidity.

The specific viscous condition of a mud may be expressed in terms of two component characteristics, plastic viscosity and yield point. The yield point of the mud is a measure of the rigidity of the system. As previously described, solid particles in the mud, primarily clay particles, have both positive and negative electrical charges of ionic nature along the broken edges of the particles. When the particles are at rest in the slurry, they tend to align themselves so that positive charges are adjacent to negative charges. The minimum shearing force which will prevent such alignment is called the yield point of the fluid, and is usually expressed in pounds per 100 square feet. The yield point of a mud must be sufficiently high to suspend cuttings and weighting material, but must not be so high that it offers excessive resistance to pumping or prevents removal of cuttings by settling in the surface mud system.

The plastic viscosity of a fluid such as drilling mud is a measure of the shearing force, above the yield point, which is required to produce unit change in the rate of shear. Plastic viscosity is a function of the viscosity of the liquid phase and of the concentration and asymmetry of solid particles. Effectively, plastic viscosity is a measure of the mechanical friction in a drilling mud, the frictional resistance to flow resulting from solid particles rubbing against each other, liquid rubbing against solid, and internal (molecular) friction in the liquid.

The plastic viscosity of a drilling mud can be significantly decreased only by adding to the liquid phase of the system, thus decreasing the concentration of solids. However, the yield point component, or structural rigidity, of the system can normally be decreased by the use of dispersants, commonly called viscosity-control agents, or "thinning" agents. The most commonly used dispersants for water-base drilling muds are the natural tannins, lignitic materials, sulfonated wood by-products, and the various complex phosphates.

These dispersants have one point in common. They ionize in water to produce extremely large negative ions. These negative ions are adsorbed on broken edges of solid particles, neutralizing some positive charges and effectively shielding others, thus decreasing the tendency of the solid particles to form a rigid structure in the mud. Thus, it may be possible by treatment with dispersant to reduce a mud of original putty-like consistency to a fluidity approaching that of water. Proper intermediate control of such a system may maintain rheological (flow) properties which are suitable for a drilling mud.

The action of dispersants may be opposed and overridden by high concentrations of electrolytes. Certain dispersants may quickly lose their effectiveness at elevated temperature. Many dispersants require careful control of mud alkalinity in order to obtain most effective dispersing action. Because of such variable factors, the dispersant for any mud system

(Please turn to page 98)

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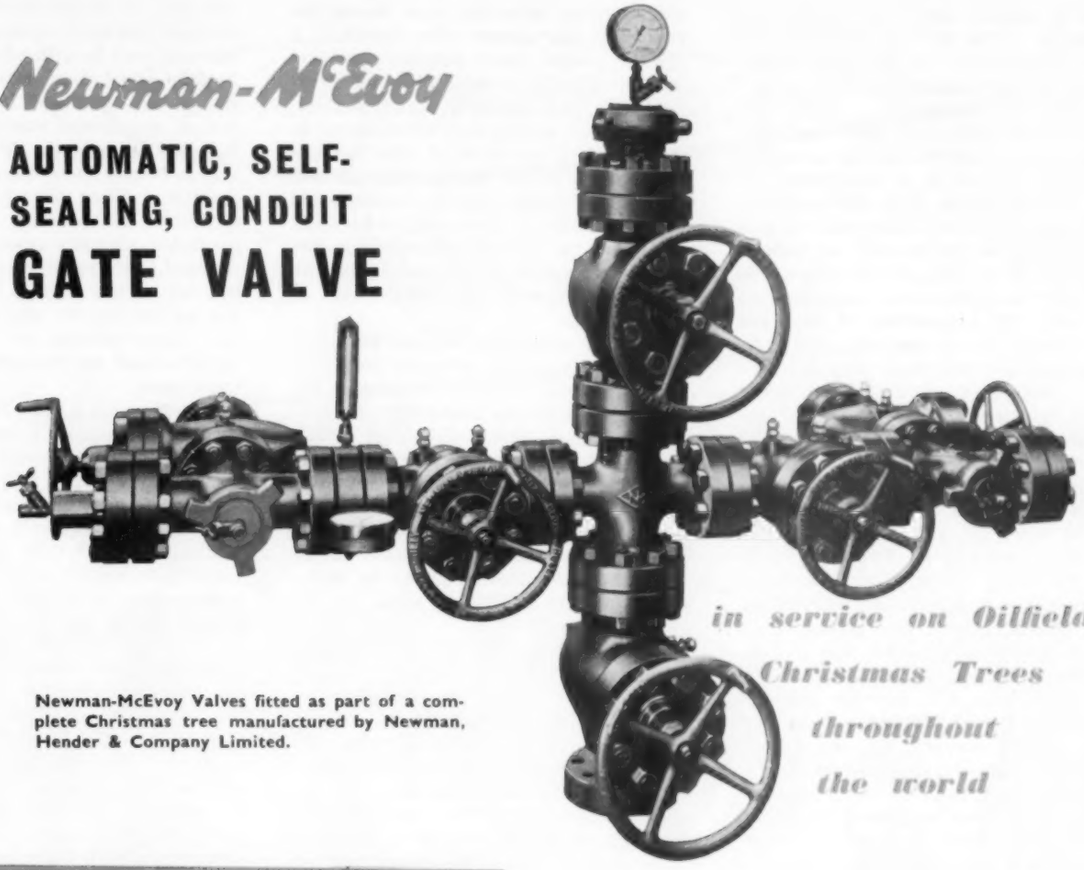

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must be chosen only after careful consideration of the drilling conditions and other requirements of the mud system, as well as cost and performance of specific dispersant materials.

A drilling fluid must have the ability to form a filter cake on porous formations to prevent the loss of an appreciable volume of mud filtrate into the formation. Concurrently, the filter cake must be sufficiently thin so that it will not hamper movement of the bit and drill pipe within the hole. Good filtration characteristics also limit the penetration of mud and mud filtrate into potentially productive formations and minimize damage to the future productivity of oil or gas. In many known instances, the productivity of specific zones has been seriously impaired or sometimes completely lost because of penetration by mud fluid.

Size distribution of the solid particles present in a drilling mud is a basic variable that controls its plastering and filtration properties. In most drilling fluids, solid particles may exist in sizes ranging from sub-microscopic to cuttings which may be larger in diameter than a dime. An ideal condition of balanced particle-size distribution will vary for different formations, but should range from particles slightly larger than the largest pore-entry diameter for a formation, to extremely small particles which have the function of sealing very small interstices in the filter cake. Presence of intermediate-sized particles is also necessary in order to provide the mud with the ability to form a relatively impermeable filter cake. For example, a fine-grained sandstone formation might require particle-size distribution which could be readily available from a conventional fresh-water bentonite mud, whereas a fractured or vuggy limestone might even need fibrous or coarse granular additives in the mud to aid bridging properties.

Thus, the openings into the formation are initially bridged by such particles as cuttings, sand, or large particles of weighting material. Interstices between these large particles are plugged by large clay particles or by small grains of sand or weighting material. This initial cake then filters out the finer clay particles, at which time the filter cake permeability has reached a minimum value. If still more impermeable filter cakes (and lower filter loss) are required, this final action of the finer clays is usually supplemented by pre-treating the mud with starch, sodium carboxymethylcellulose (CMC), or other high molecular-weight organic materials which tend to become gelatinous when placed in water. Emulsification of oil in the mud is also an effective method of obtaining low filter-loss muds.

Very heavy and expensive treatment may be necessary to maintain very low filter loss under difficult conditions. The cost of such treatment may be of the order of $1,000 per day in extreme instances. Proper choice and use of available treating materials is an obvous necessity in such cases. The choice of a specific product must consider cost and local availability, compatibility of product with the conditions and requirements of the mud system, effectiveness in the immediate reduction of filter loss and permanence of the effect of treatment. This latter factor involves consideration of the stability of the product to bacterial action and the possible decomposition, hydrolysis, or modification of the product by reaction with other mud components or contaminants.

As noted previously, oil may be added to a water-base mud, normally producing an oil-in-water emulsion. A primary objective is usually the production of a low-filter-loss mud. Other objectives, which individually may assume primary importance in specific instances, are to assist in control of mud density or to decrease torque requirements in drilling. Additional effects of such emulsification are to increase mud viscosity and, in many cases, to increase drilling rates and bit life.

In order to stabilize such an emulsion, emulsifying agents are added to the mud system. These agents are characteristically hybrid-type compounds, with one end of the molecule being oil-soluble and the other end being preferentially water-soluble. Thus, the molecules collect at the oil-water interfaces and suppress the tendency of the oil droplets to coalesce.

Emulsifiers should be chosen on the basis of cost, local availability, ease of handling, effectiveness of emulsifying action in the specific mud system, absence of objectionable characteristics such as foam production and stability to expected contaminants. Since many emulsifiers are also effective dispersants, the possible advantages of such combined action should be considered. For instance, if such double-purpose dispersant is utilized early in the drilling program, the later conversion to an emulsion will be relatively easy and may not require the use of additional emulsifying agent.

The use of emulsion muds appears to be steadily increasing. It is probable that many emulsifiers useful in this work will be found among the great number of synthetic surface-active materials now being produced by the chemical industry.

During the drilling operation, the nature of the drilling mud may be changed by inclusion of contaminating materials from the formations being drilled, the principal contaminants from such source being shale, salt (sodium chloride) and anhydrite (calcium sulfate). In drilling cement plugs left after cementing operations, soluble calcium compounds are also introduced into the mud system.

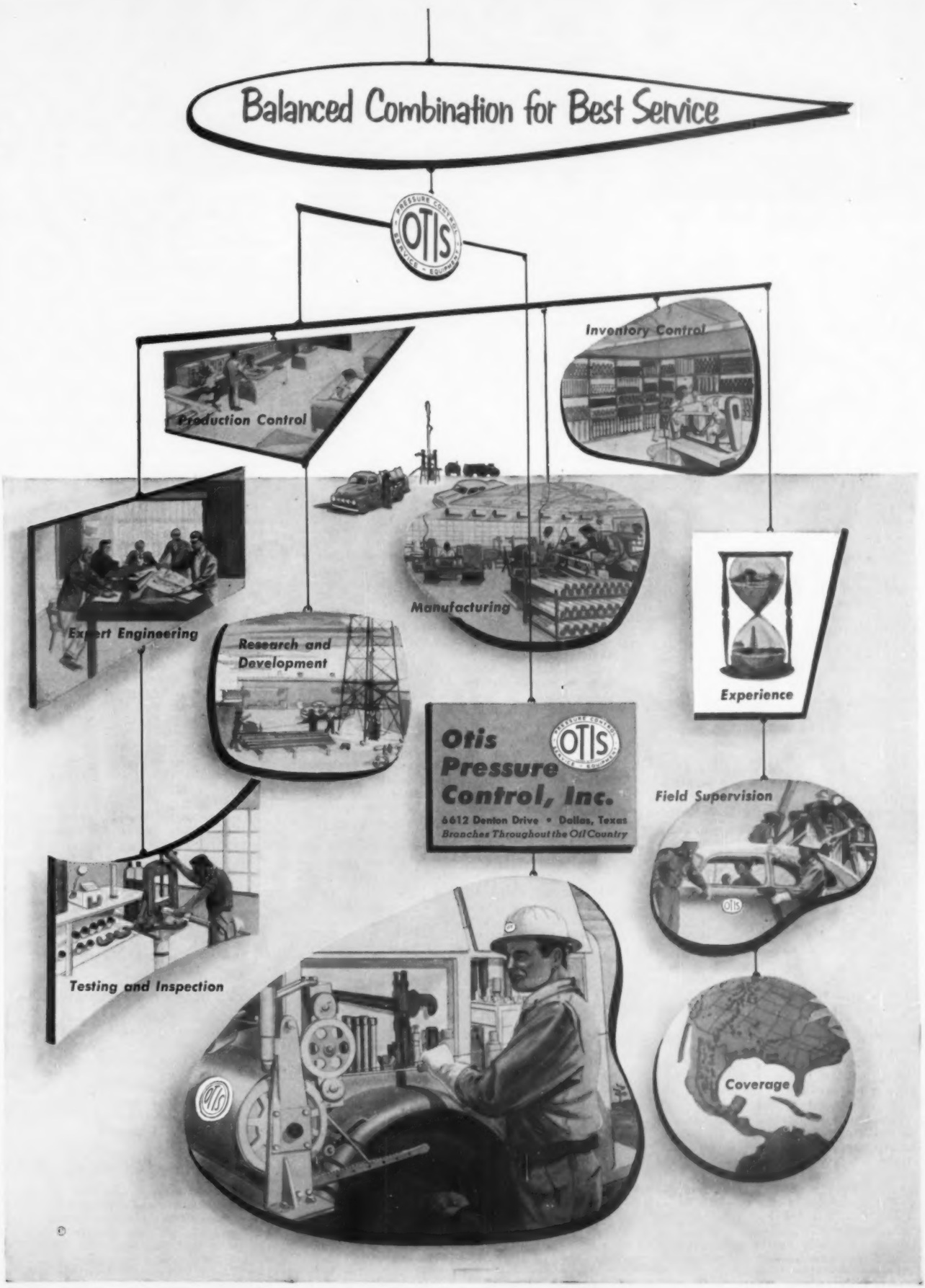
Although calcium ions (from cement or anhydrite), for instance, can be removed from the mud by chemical treatment, it is often advisable or even necessary to condition the mud system so that this, or other, contaminant can be tolerated. For example, in drilling thick sections of rock salt, the mud becomes saturated with salt and must be utilized as such. The effectiveness of most mud-treating materials is greatly reduced in a salt-saturated system, and careful planning of the treating program and careful control of the system become more essential under such conditions. Since clays will be relatively ineffective in reducing filter loss or in producing adequate suspending power in the mud, more reliance must be placed on the use of the organic filter-loss reducing agents and on the improved filtration characteristics and increased viscosity caused by emulsification of oil in the system.

In drilling thick shale formations which contain active clays, it may be necessary to continuously dilute and reconstitute expensive mud unless the "mud-making" potential of the shales can be suppressed. This is most frequently accomplished by treating the mud with lime in sufficient quantity to convert, at least partially, the sodium clays to calcium clays which contribute less to mud viscosity and, consequently, can be tolerated in higher concentration. The inclusion of salt in appreciable concentration in the mud will also effectively suppress the swelling and dispersion of the shales.

Modern deep drilling is encountering another hazard to successful operations in greatly increased formation temperatures. Bottom-hole temperatures approaching 400°F have been encountered, and at such temperatures many mud-treating chemicals become less effective or fail altogether. The hydrolysis of many heavy organic molecules is greatly accelerated. Other reactions which are very slow at ordinary temperatures, such as that of lime or dilute caustic soda with siliceous minerals, seriously handicap drilling mud control at high temperatures. For these reasons, deep drilling often requires extensive modification or replacement of the mud system which was well-suited for drilling the shallower and cooler portion of the hole.

The discussion presented above summarizes briefly the more pertinent aspects of the utilization and treatment of conventional water-base and oil-in-water emulsion muds. It has not considered the various special-purpose water-base muds, water-in-oil emulsion muds, oil-base muds, or the non-liquid drilling fluids such as natural gas or air. However, some idea of the scope and complexity of formulating and controlling these systems has been conveyed. The basic principles involved encompass, but are not limited by, the fields of chemical and petroleum engineering, geology, and inorganic, organic, and physical chemistry.

The drilling mud "expert" of today must have a sound technical training, aptitude for the engineering application of fundamental information, and a broad experience in the idiosyncrasies of "drilling muds."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Coverage

Aerocem fuel tank insulation, showing spraying of insulating concrete.

Concrete Aero Mixer Has Many Uses

A concrete spraying process has recommended itself to British oil companies as serving many useful purposes in the petroleum industry. It is called Aerocem and produces an aerated concrete mix that can be applied by an apparatus as simple in construction and operation as an ordinary paint gun. The resulting product, on drying, is much lighter than ordinary concrete, more water-proof, and has greater fire resisting and thermal insulation properties.

Patents covering the process have been granted in 54 countries and further patents are pending which will give world-wide coverage.

The essence of the process is the entrainment of air into the compound to be used in the form of microscopic uniformly-distributed cells. This distribution is accomplished by the use of a special foaming compound "Teepol" in the water used in making the mix. This compound also acts as a wetting agent for the cement and aggregate. The choice of aggregate is almost unlimited and therefore the mix can be prepared from selected materials, giving special properties to the dried concrete.

Any type of cement, rapid hardening, acid resisting or alumina, can be used. The usual aggregate is sand, but this can be either totally or partially replaced by other aggregates such as vermiculite, perlite, leca-fines, glass, mineral wool or asbestos.

Other additions which can be used are bituminous emulsions, rubber latex and various synthetic resins. The size of non-fibrous aggregates is limited by what can be passed through a 3/16-inch gauge sieve. Lime and plaster can also be aerated.

With any or all of these aggregates combined in varying proportions, an almost unlimited variety of aerated compounds may be devised to suit any particular purpose.

"Aerocem" is prepared in a specially designed apparatus known as the "Aero-Mixer." The mixing and aeration is performed by vortex produced by a specially designed mixing shaft, the speed of which is 800 rpm. This shaft is fitted with three mixing blades, five inches long and four inches wide with variable pitch, and with detachable and adjustable blades for foaming. Two sizes of mixer are in general use, one of four cubic feet and one of eight cubic feet, each capable of producing their respective quantities of "Aerocem" in five minutes.

The first step in the operation is the production of foam by mixing water and a specified quantity of special "Aerocem" foaming agent. The foam is allowed to reach the top of the container, but not to overflow. The whole of the cement is then fed into the mixer at such a rate as to keep the foam-level. Afterwards the selected aggregate is fed in under the same conditions. Thus the whole charge of the mixer is thoroughly mixed and aerated.

On completion of this step, the aerated concrete is transferred to a pressure vessel of the same capacity as the mixer.

The "Aerocem" spray gun which is used for placement of the concrete is of a type similar to a paint spray gun, but has been specially designed for the process. The gun is of simple construction and has only five component parts. By adjusting the air cap and varying the volume of secondary air in relation to speed of delivery of the material, the texture of the finishes can be varied.

Book Review

"Geologic Aspects of Radio Wave Transmission," by M. William Pullen; Illinois State Geological Survey *Report of Investigations—No. 162* (1953); Urbana, Illinois.

The author states that the major objectives of this investigation "were to collect data on field intensity of transmitted radio waves, and to determine what influence geologic conditions and earth materials have on field strength." After a brief discussion of theoretical considerations, and a review of the literature on the subject, a description of the instrumentation is given. The main component was an R.C.A. Type 308-B field-intensity meter capable of covering a frequency range from 120 kilocycles to 18 megacycles. It was battery-operated and provided with a shielded loop antenna. The output of the field-intensity meter was fed into a Model A.W. Esterline-Angus recorder, and both instruments were shock-mounted in a wooden-bodied station wagon. The paper chart of the recorder was actuated by a Clark drive connected to the speedometer cable of the automobile, so that continuous records of field intensity could be made while the vehicle was driven along selected traverses.

Using broadcast stations as sources of radio-frequency energy, and confining the measurements to daylight hours to eliminate sky-wave reception, several hundred miles of traverses were run, mainly in Illinois, but for clarification, some were run in Kentucky, Indiana and Wisconsin. Traverses commonly were rerun several times, using different broadcast stations with different frequencies, powers, distances, and directions of signal arrival. While running a traverse the loop antenna was oriented manually for maximum signal reception.

Detailed attention was given to the effects of cultural and natural features such as overhead wires, steel bridges, railroad tracks, metal structures, wire fences, pipe lines, woods, bodies of water, soils, and topography, for the purpose of distinguishing between field-intensity anomalies arising from these features and those due to subsurface geologic causes. It was found that most of these features had some effect on signal behavior, especially overhead wires and steel bridges, but that the effect of many such field hazards may be recognized and separated from the geologic influence. It was also learned that, when relatively constant weather conditions prevail, meteorological effects appear to be negligible for daytime periods up to six hours.

Investigations of the following types of geologic features were made: bedrock with faulting, bedrock with folding, cryptovolcanic structure, variation in soil types, variation in bedrock lithology, variation in depth to uniform bedrock, buried glacial drift-filled valleys, and ore deposits.

Anomalies in signal strength were observed on traverses across known faults. In one instance the fault was buried under 100 to 150 feet of alluvium and glacial outwash.

A field-intensity survey was made over a cryptovolcanic structure near Kentland, Indiana, where Ordovician rocks have been pushed up through younger Paleozoic sediments. The field intensity was found to increase over the structure, presumably either by reflection or by selective transmission along preferred strata. Variation in thickness of cover over the bedrock did not appear to be a contributing factor in the observed anomaly.

Another survey was made at the Hicks dome in Hardin County, Illinois, which is a large uplift believed, though not proved, to be associated with igneous intrusion. In this instance lower signal intensities were recorded over the older rocks in the central part of the structure. As the transmitting site was on Pennsylvanian strata, which surround the dome on its flanks, the author suggests the possibility that part of the energy may have been propagated through or along the rock strata that outcrop at the transmitter.

Numerous traverses were obtained in northwestern Illinois over ore deposits lying at depths between 100 and 600 feet. In one case a strong field-intensity anomaly was observed which subsequently was tested by a drill hole. The hole encountered abundant pyrite between depths of 50 and 100 feet, but neither lead nor zinc was found in commercial quantities. All of the anomalies associated with ore bodies were minima. Traverses were also obtained over mined-out areas, and the results indicated that such air spaces cause either no, or negligible, anomalies in field intensity.

Traverses run in Illinois over various types of soil derived from glacial drift did not develop appreciable anomalies in signal intensity that could be correlated with soil types. However, Pullen suggests that, in view of the effect noted from bedrock, recognizable variations in field intensity might be associated with residual soils in non-glaciated areas.

Depth to bedrock may influence signal strength but the kind and amount of such influence could not be determined during the program reported. Some anomalies were obtained where depth to bedrock was known to be variable but the anomalies could be explained by other causes. The same was true of traverses over sand and gravel deposits.

The author advances the possibility that radio-frequency signals may be transmitted for considerable distances through a poorly conducting stratum that separates more conducting strata, after the manner of a geologic wave guide. In support of this concept, he states that reception generally is best when the transmitting and receiving antennas are on (or close to) the same rock strata.

For the most part Pullen confines his remarks to a recitation of the observed facts. Although he suggests possible interpretations of the data collected, he quite properly refrains from drawing general conclusions. He points out that further study of the geologic aspects of radio-wave transmission is needed to help resolve the method. The report may be read profitably by all who are interested in the propagation of radio waves through or along the earth.

Wm. M. Barret

Field Tester

The MB-1 Oscillator, with an SIE Geophysical Microvolter, has been developed by Southwestern Industrial Electronics Co. for the testing of geophysical equipment in the field. Battery powered, it provides signal frequencies from 2 to 20,000 cps AC, or DC pulses at calibrated amplitudes of 1 microvolt to 1 volt. The attenuator can match load impedances from 10 to 500 ohms. The oscillator may be used separately with an output signal strength up to 5 volts.

The company has also announced the development of the PRO-11-10 recording oscillograph equipped with 50 SIE precision galvanometers mounted in two 25-element blocks.

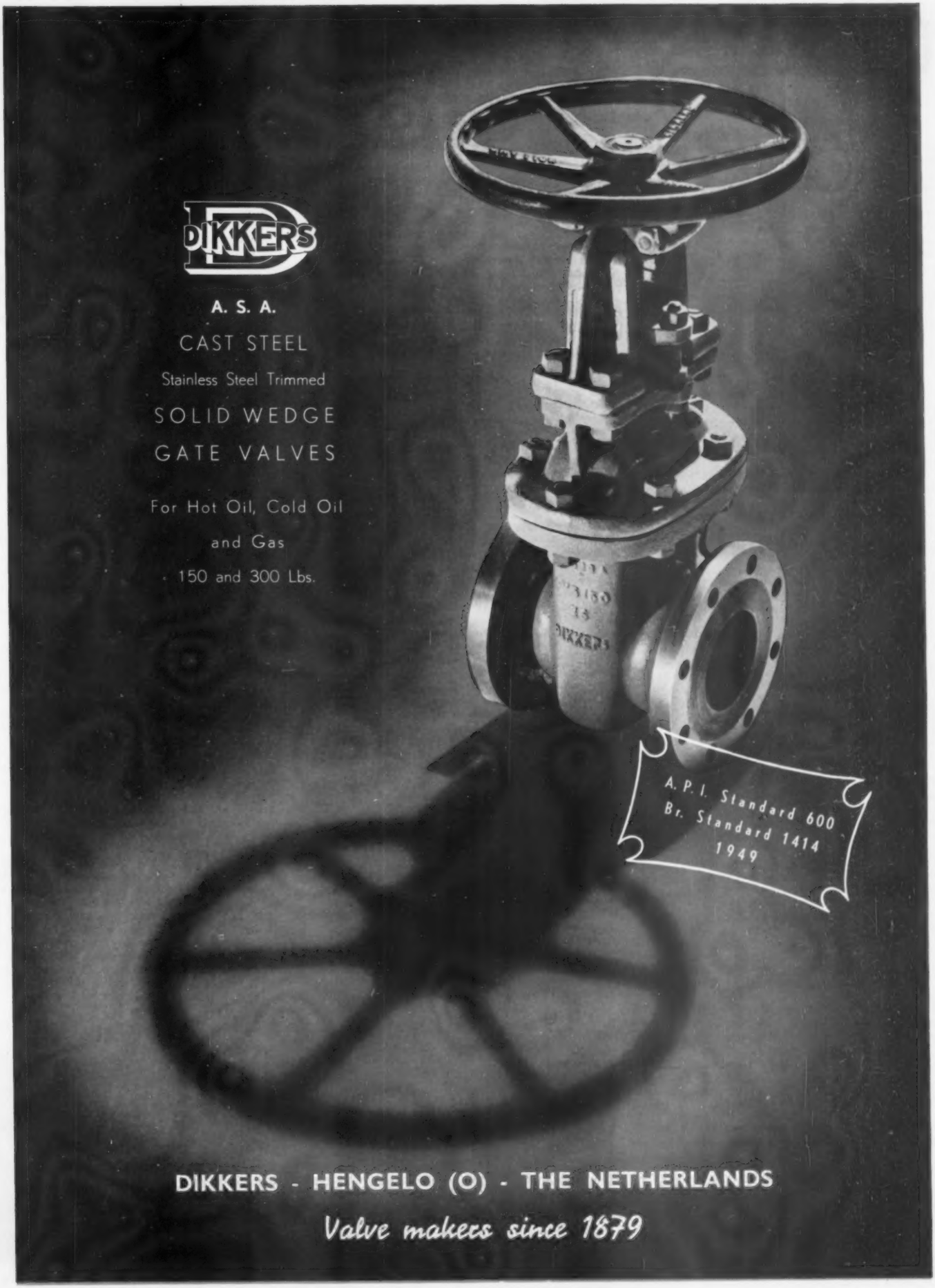
Accommodating 10-inch paper and offering a wide range of paper speeds, the PRO-11-10 can be used with any type of system. The unit is contained in a welded aluminum case equipped with a carrying handle and a watertight cover. Provision is made for permanent mounting in a field vehicle and the timing system and galvo structure are shock-mounted for long life. The light-tight record magazine is easily removed for daylight developing and the oscillograph can be loaded in daylight.

McKee Earnings Rise

For the third consecutive year, Arthur G. McKee & Company, engineers and contractors for petroleum refineries and petrochemical plants, will report record net earnings. Consolidated net profit of the company and its Canadian subsidiary for 1953, after taxes and based on preliminary unaudited figures, is estimated at approximately $2,520,000 compared with actual net profit of $2,454,884 for 1952.

Secondary Recovery in Kansas

The Interstate Oil Compact Commission announces publication of a pamphlet entitled "Summary, Secondary Recovery Operations in Kansas During 1952." Copies may be obtained free of charge from the headquarters office of the Interstate Oil Compact Commission, Box 3127, State Capitol, Oklahoma City 5, Okla. The report is the fifth in a series of pamphlets on secondary recovery operations in Kansas.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BRITISH OIL NEWS

By E. Lawson Lomax

Influence of the great expansion in Britain's refining facilities is reflected in exports of petroleum products. In 1953, according to the Petroleum Information Bureau, these exports amounted to more than seven million long tons, valued at over £71,000,000 as compared with shipments of 5,150,000 tons in 1952 with a value of £52,000,000. This represents an increase of roundly 40 percent, of which the largest component (4,300,000 tons) was fuel oil. The greatest proportional gain, however, was in motor spirit, which rose from 350,000 to more than a million tons, a direct reflection of bringing into operation the catalytic cracking units installed during the past two years.

Premium Gasoline "War"

A minor gasoline war started in Great Britain early in January, but it is one which involves quality rather than price, as there is little margin for price differences in the case of premium grade gasoline owing to the fact that over 50 percent of the service station's price is absorbed by the government tax.

Early in January three major distribution companies, Shell-Mex & B. P., Esso Petroleum Co. Ltd., and Regent Oil Co. Ltd., came out with simultaneous advertisements announcing that improved grades of premium gasolines would henceforth be on sale at all garages and service stations without any increase in price.

Shell's new grade is marked ICA (ignition control additive), Esso's new grade is marked NSO (naphthenic solvent oil), and Regent's new TT grade claims "volatane control" with an octane rating of 90+.

The use of ICA was started in Shell gasoline in the United States in May 1953, and proved popular, particularly in automobiles with engines of high compression ratios. Its chemical name is trieresyl phosphate and its beneficial qualities were discovered during an investigation of the fouling of spark plugs in aviation gasoline. The new gasoline is sold at the same price as the old premium grade.

Esso Petroleum Company's additive, NSO, like the ICA of Shell, is covered by patents. It is a special fraction of crude petroleum which, it is claimed, has important solvent properties that have a powerful effect on the gummy deposits which may form on valve stems, particularly inlet valves and in the piston ring zone, preventing the accumulation of harmful deposits, materially increasing engine service time and reducing the frequency of dismantling engines for decarbonizing and valve service.

Regent urges its TT as the product of special refining processes and declares that by the use of crudes containing naturally light fractions of high octane value, it is producing a gasoline with 90+ octane which, it claims, is the best all-around spirit in the market.

In the United States the average compression ratio of automobile engines is higher than in Great Britain, but the tendency here is for compression ratios to increase, and it is evident that the major distributors are looking to the future in the quality of their gasoline.

Pyrene Ltd. Buys Pyrene of Canada Capital

The Pyrene Co. Ltd. announces that it has entered into a contract to purchase the whole of the share capital of the Pyrene Manufacturing Co. of Canada Ltd., which was previously a subsidiary of the Pyrene Manufacturing Co., Inc., of Newark, N. J. This follows the acquisition by British interests of the majority holding in the United Kingdom company previously held by The Pyrene Manufacturing Co. of America. This is described as a dollar-saving deal, whereas the purchase of the Canadian company's shares becomes a dollar-earning deal.

Personnel

Simon J. Vos, chairman of Trinidad Leaseholds Ltd. and Regent Oil Co. Ltd., left on January 20 for a visit to the United States and an extended tour of the West Indies where he will visit the properties of Trinidad Leaseholds Ltd. and see at first hand the new developments in operation. He is accompanied by E. G. C. Mardall, who has been appointed joint managing director of Trinidad Leaseholds.

Mr. Mardall was born in Natal, South Africa, in 1903. He received part of his education there and part in England. He joined Central Mining & Investment Corp. in 1925 and was transferred in 1929 to Trinidad Leaseholds Ltd., where he served progressively as assistant engineer, chief engineer and assistant general manager. In 1952 he was transferred to the London office as assistant managing director and in December 1953 was made joint managing director with A. J. Ruthven Murray.

H. R. Barker, secretary of London & Thames Haven Oil Wharves Ltd., in addition to this position has now been appointed manager of the company with which he has been associated since 1939.

The Royal Dutch/Shell group announces that Sir Frank Whittle, the British pioneer in the field of jet propulsion, has taken up an appointment with the Bataafshe Petroleum Maatschappij (BPM) at The Hague. He will act as advisor in the field of mechanical engineering relative to the development of techniques and equipment in the petroleum and petrochemical industries.

Under a reorganization which took effect on January 1, Esso Petroleum Co. Ltd. has reassumed direct control over its tanker fleet, which was formerly managed by Esso Transportation Co. Ltd. The latter company will continue as a separate entity, its main function being to arrange tonnage for the marginal requirements of the European Esso affiliates.

Consequent upon this reorganization, it is announced that W. F. Wackrill, a managing director of Esso Transportation Co. Ltd., has been appointed to the board of directors of Esso Petroleum Co. Ltd., where he will act as contact director for the newly-constituted marine department.

Prior to joining Esso Transportation Co. Ltd. in 1946, Mr. Wackrill had been with the Ministry of Shipping since its formation in 1939. In 1947 he became a director of Esso Transportation Company and a managing director in 1952. He is a member of the Council of the Chamber of Shipping, the Executive Council of the Shipping Federation, and of the Committee of Lloyd's Register of Shipping.

At the same time it is announced that G. W. Powell, previously co-ordinator of supplies & shipping, is to be manager of the marine department. Mr. Powell recently completed 30 years' service with the company.

The marine department will be responsible for the management and operation of all the deep sea ships of Esso Petroleum Co. and Esso Transportation Co., including a number of ships on bareboat charter. It will supervise the maintenance and repair of these vessels and be responsible for all new ship construction on behalf of the Esso group in the United Kingdom. It will also undertake the negotiation of tanker charters for Esso Petroleum Co.

New Automatic Lube Blending Plant at Manchester

Manchester Oil Refinery Ltd. has installed a new automatic lube oil blending plant in its refinery which has a maximum output of 90 Imperial gallons per minute or about 450 tons per day. This unit, the first of its kind to be installed in Britain, was manufactured by the Cornell Machine Company of America and is continuous and fully automatic. It consists of two distinct parts: a proportioning panel, which controls the ratio of the components of the blend to an accuracy of 0.1 percent by volume; and a homogenizing section, which completes the thorough dispersion, de-aeration and dehydration of the components. The simultaneous operation of the two sections is controlled and synchronized by instruments.

The unit is capable of accurately handling six individual components at once, and thus a limited number of "base" oils, together with additives, can be blended to give a finished oil to customer's exact requirements.

Ruston & Hornsby Receives Gas-Turbine Orders

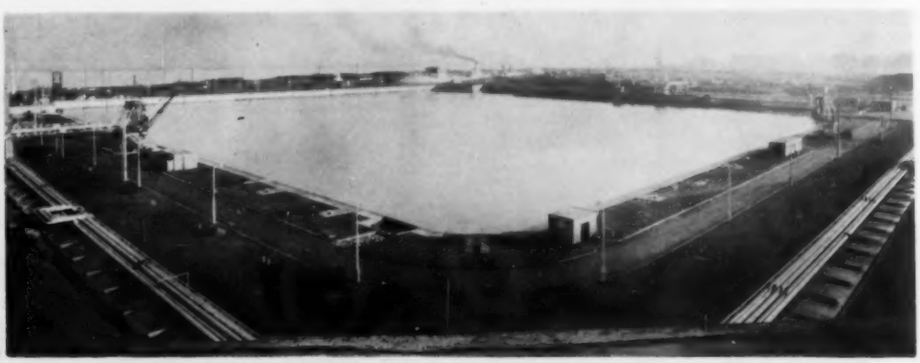
Ruston & Hornsby Ltd. has received an order amounting to £635,000 for gas turbines for a London County Council sewage works, and also an order for a gas turbine for the Societa Nationale Metanodotti, Italy, to operate on natural gas in driving an alternator for supplying light and power to the administrative part of the organization, which will include stores, repair shops, bottle filling stations, garages, research station offices and dwellings. Waste heat recovery plant will be installed to give heat to these buildings in winter time.

New Petroleum Dock at Manchester

The Manchester Ship Canal, which is the seaward extension of the Port of Manchester, the entrance being 36 miles away from the town, has just opened a new petroleum dock in addition to the two previously in use, one opened in 1922 and the other 11 years later. The new dock is designed to accommodate the new super-tankers too large to be berthed in the older ones.

Work was commenced on the site in November 1949 and the new dock was formally opened on January 19, 1954, by Sir Leslie Roberts, chairman and managing director of the Manchester Ship Canal Company. It is appropriately named the Queen Elizabeth II Dock. This latest addition to Manchester's shipping facilities is the largest oil dock in Great Britain, covering an area of about 19 acres, and has been constructed for handling tankers of 30,000 dwt and over, four of which can lie in the dock at one time.

The approach to the dock is from the River Mersey through a channel dredged to a depth of 15 feet below Liverpool Bay datum. The channel is approximately 500 feet wide and the depth at high water is 44 feet. The entrance lock has a length of 807 feet and a width of 100 feet. It has three sliding gates or caissons of all-welded steel construction, each weighing 1,700 tons, made by Vickers Ltd. at Barrow-in-Furness and from there towed by tugs for 80 miles along the Lancashire coast to their destination.



The Port of Manchester's new oil dock at Eastham, the largest in Great Britain.

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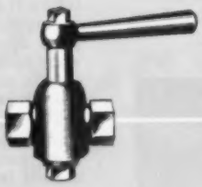

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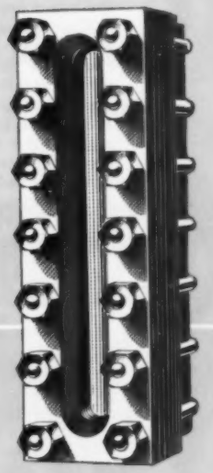

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Tanker Launchings

On January 1 Regent Oil Co. Ltd. launched the motor tanker "Regent Royal," built by the Blythswood Shipbuilding Co. The launching took place at the builder's yard in Glasgow and the naming ceremony was performed by HRH The Princess Royal.

The tanker will be used for transporting Regent petroleum products from Trinidad Leasehold's Pointe-a-Pierre refinery at Trinidad to the United Kingdom. It has a deadweight of about 15,000 tons, an overall length of 574 feet, breadth of 65 feet six inches and draft of 28 feet three inches. It will be powered by a 4-cylinder Doxford opposed piston type motor and will have radar and other modern navigational aids. It also has accommodation for members of Trinidad Leasehold's staff and their families who may travel between Trinidad and the United Kingdom.

Another tanker launching took place on January 19 when the single screw motor ship "Border Fusilier" took to water at the yards of R. & W. Hawthorne Leslie & Co., the sponsor being the Duchess of Northumberland. The vessel has a length overall of 547 feet, a moulded breadth of 69 feet six inches and a deadweight of about 16,100 tons.

The propelling machinery consists of a single-screw Hawthorn-Doxford engine having six cylinders of 670 mm bore and 2,320 mm combined stroke, developing 6,400 bhp on service at 115 rpm. There are four steam-driven horizontal duplex cargo pumps supplied by Hayward Tyler & Co. Ltd. These are supplied with steam at 150 pounds from two auxiliary boilers which can utilize the exhaust gas from the main engine to produce steam for the steering gear and all other steam-driven units in normal operation at sea.

Harland and Wolff Ltd. report that the motor tanker "Jaranda," built by them for the Norwegian firm of Anders Jahre & Co., successfully completed her sea trials on January 8 and has been handed over to her owners.

Swan, Hunter & Wigham Richardson Ltd. announce that the sea trials of S.T.S. "British Merchant," built for the British Tanker Co. at their Wallsend shipyard, took place on January 19 and 20. The vessel goes immediately into service for the transport of Middle East crude to refinery destinations.

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New Thickness Gauge

A new instrument which should save time and trouble for the oil industry has been developed by Dawe Instruments Ltd., a London firm. It is called a thickness gauge, and can measure in the course of a few minutes the thickness of walls of which only one side is accessible. Heretofore it usually has been necessary to drill holes in pipes, pressure vessels, boilers and similar plant to check the decrease in thickness due to wear by erosion, corrosion or other causes. This entails shutting down of plants and consequent loss of production.

The new instrument generates an ultrasonic signal and injects this signal into the material being gauged by means of a crystal probe which is held in close contact with the material. The signal is reflected from the inaccessible surface of the material as light is reflected by a mirror, and the reflected signal is picked up again by the same probe.

The outgoing and returning signals interfere with each other and under certain conditions resonance occurs as the outgoing and incoming waves reinforce each other. These conditions depend on the thickness of the material, which determines the length of the path of the signal, and on the wave length of the signal. For a given thickness of material, there will be a basic resonance when the wavelength of the signal equals twice the wall thickness, and there will be successive resonances for simple divisions of this wavelength, the socalled "harmonics."

The wavelength of the signal generated by the ultrasonic thickness gauge can be varied. If this is done while the probe is in contact with the material, a meter on the gauge, or headphones plugged into it, will indicate the maxima which occur when resonance is set up. Since the wavelength is known and the speed of sound in any one material is also known and remains constant within close limits, the thickness of the material can be calculated. Actually, no calculation is necessary with this gauge, as, once it is set to a certain material, the thickness is indicated directly on a dial. The range of the instrument is from 1/16 inch to 12 inches in steel.

Middle East Production Figures

Production figures of Middle East fields for December and for the year 1953 as compared with 1952 are reported as follows:

	DEC. 1953 LONG TONS	1953 LONG TONS	1952 LONG TONS
Iraq Petroleum Co. Ltd. (Kirkuk)	1,974,653	22,865,538	15,552,715
Basrah Petroleum Co. Ltd. (Zubair)	307,046	3,077,522	2,238,177
Mosul Petroleum Co. Ltd. (Ain Zalah & Butmah)	98,361	1,277,139	269,905
Qatar Petroleum Co. Ltd.	342,972	3,997,926	3,245,150
Kuwait Oil Co. Ltd.	3,983,242	42,603,244	37,042,122
Aramco	3,602,149	41,543,736	39,870,805
		115,365,105	98,218,874

"Turbogrid" Distillation Trays

Metal Propellors Ltd., British manufacturers of the American-designed Glitsch "Truss-Type" bubble trays, announce that they have been granted a license to design and supply the Shell Petroleum Co.'s patent "Turbogrid" distillation trays and that the manufacture of a number of these trays is already in hand.

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SIE

Presented before the Kansas-Oklahoma Water-Flood Operators Meeting at Bartlesville, Oklahoma, December 9, 1953.

Control and improvement of water treatment in secondary recovery

By J. Henry Prusick

Research Director, Orchem Corp., Austin, Texas

ADEQUATE SUPPLIES of water of proper quality are of prime importance for the success of water flooding operations. Many operators, even today, do not sufficiently appreciate the need for corrective treatment of water.

The main objective in such treatment is to maintain the highest practical rate of injection and to get the greatest economic recovery of crude oil from the development. Prevention of unintentional plugging of the sand at the input well is necessary in order not to cause a decrease in the input rate.

A second important objective is to eliminate or control the corrosive characteristics of the water. Corrosion of pipes and equipment, by continual contact with corrosive water, bring not only economic loss to the operator through maintenance and replacement expense, but also attendent loss in recovery by the plugging of injection wells by suspended corrosive products.

A third important factor, not always recognized unless it is actually observed, is that of algae and especially bacterial growth. If the growth of algae or bacteria is not prevented or effectively controlled in the injection water, serious plugging of the intake wells may result.

A fourth factor which may or may not be involved is the presence of hydratable clays of the bentonitic type in the reservoir sand. These clays can swell when contacted by injected water and cause plugging of the intake wells.

Finally, an important factor which has just recently been considered and studied at some length, is that of making water more efficient for its purpose.[1]

Water, whatever its source, ordinarily contains many impurities varying in kind and in quantity. These impurities are of direct interest for one or both of two reasons: will they plug the sand, and will they cause corrosion?

Suspended matter such as silt, mud, iron, and organic matter will cause plugging of a sand very rapidly even when present in small amounts. Corrective measures for control should include settling and efficient filtration of the water.

Dissolved gases such as oxygen, carbon dioxide and hydrogen sulfide are all sources of corrosion and its attendent troubles.

Certain microscopic organisms, if present in the water, not only can plug sands by their growth and multiplication, but may also create a serious corrosion problem.

Calcium, magnesium, and barium may form compounds which can plug the sand and may also be a factor contributing to corrosion. It is important to determine the compatibility of the water intended for flooding with the interstitial water of the reservoir. Incompatibility of the waters may be noted by an increase in turbidity which will result from the formation of insoluble precipitates.

The handling of water may be grouped

(Please turn to page 108)

[1]Holbrook, George W., and A. R. Ellenberger, "Source and Purification of Water Supply," SECONDARY RECOVERY OF OIL IN THE UNITED STATES, 2nd edition, p. 307.

STEEL PLATE in the OIL INDUSTRY

Steel plate . . . good design . . . first-class fabrication and welding . . . are synonymous with Whessoe, pioneers in steel plate construction. Whessoe fabricate more than 40,000 tons of steel plate per year. Finished Whessoe products are in the form of storage tanks, spheres, pressure vessels, process plant and steel plate structures . . . contributing to the advancement and growth of the oil, gas, chemical and electric industries.

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W

Control and Improvement of Water Treatment

(Continued from page 106)

under three main classifications which can be listed as the open system, the air-free system and the closed system. Each method has its desirable features, and the specific choice will be dependent upon the particular factors present in each operation.

For the purpose of this presentation, the specific problems (and their control) which will be considered are bacterial growth, corrosion, clay swelling, and water injection rates.

The growth of algae, aerobic and anaerobic bacteria in the injection water must be brought under control before trouble is experienced in the injection wells. Costly treatments to restore the normal water intake capacity of the wells can be reduced substantially by controlling such organic growths.

The use of chlorine, copper sulfate, formaldehyde, potassium permanganate and other proprietary or common chemicals can in many cases control, at least for a period of time, the algae problem as well as some types of bacteria. It has been established in many cases that algae as well as bacteria build up a tolerance toward such treatment. For example, to continue their control, higher chlorine residuals must be carried in the water or a change from one chemical to another is often necessary to offset such tolerance. In specific cases, even higher chlorine residuals will not completely control the growth of an especially troublesome anaerobic type, *sporovibrio desulfuricans*, commonly known as the sulfate-reducing bacteria.

The sulfate-reducing bacteria are widely and abundantly distributed in nature, probably to such an extent that sulfate reduction is one of the most common chemical changes due to bacterial activity.[2]

The growth of sulfate-reducing bacteria causes the release of hydrogen sulfide, which in turn leads to the formation of insoluble sulfides as the end products of corrosion. Residual and freshly formed sulfide may in a short time result in plugging of the injection wells to such an extent as to make necessary costly and time-consuming work-overs to put the well back in condition.[3]

Controlling the growth of sulfate-reducing bacteria according to customary water treatment procedures generally has not been too successful.

Much of our work has been concerned with tests of the sensitivity of the sulfate-reducing bacteria to cationic surface active agents and bactericides. The work has progressed satisfactorily from the laboratory to the field where the final proof of the newly-developed bactericides was obtained.

Working closely with the East Texas Disposal Company on the problems of controlling the growth of sulfate-reducing bacteria, it was determined that a high degree of control, over and above that possible with chlorine or other bactericides tested, was achieved by using a specific combination of chemicals. This new product was then released commercially under the trade name of Orchem-922. It was found that this product was efficient at concentrations as low as four to five ppm and that it not only controls the growth of these bacteria, but also serves as an efficient water-soluble corrosion inhibitor.

Recently another compound, Orchem-900, has been developed which, according to laboratory and field tests, is more effective than Orchem-922 for the control of sulfate-reducing bacteria and corrosion in a water system.

The problem of corrosion, caused by water in contact with metal surfaces, is of immediate concern. Corrosion can be controlled to a rather high degree by the use of water-soluble corrosion inhibitors of the cationic type. After extended study it was found that in some cases the blending of certain chemicals effected what could be termed as a synergistic action. Corrosion resulting from low pH waters, dissolved carbon dioxide or dissolved hydrogen sulfide and corrosion normally caused by high brine waters can be controlled by water-soluble organic corrosion inhibitors. Orchem-909 has been designed to control such corrosion. Orchem-909 is effective in concentrations as low as five ppm and is being used with economy and success in the field. A specific case is the control of corrosion in air-free systems handling a brine water with a 48-ppm hydrogen sulfide content. This operation is in the vicinity of Chanute, Kansas.

The swelling of clay minerals when in contact with the injected water is a serious problem. Although the clay content of the sand may not be large, it may change to a marked degree the physical properties of the surfaces of the sand. The hydration of clay particles when they are in contact with the injected water, and their base exchange capacities may affect in a substantial manner the permeability of the sand to water.

The presence of bentonitic clays should cause concern over the use of fresh water for injection. Better control can be achieved where a slight clay condition is present by the use of a suitable brine water. It also has been demonstrated in the past, both in the laboratory and in the field, that in many cases it would be desirable to flood with a low pH water. Acidic waters tend to flocculate clay particles and thereby retard their swelling. The use of an effective water-soluble corrosion inhibitor in connection with the injection of an acidic water is necessary.[4]

A scheme which has been tried in the field involves the injection of acid ahead of the water at the beginning of the flood. The acid will be pushed on ahead of the water and will have a flocculating effect on the clays it contacts until it is spent or diluted some distance beyond the well bore. The follow-up flood water can contain from 50 to 100 ppm of a combination of surface-active agents which are specific combinations of non-ionic compounds together with certain types of cationic chemicals. The cationic chemicals will coat the clay surfaces in contact with the water containing them and become a part of the reservoir surface. The degree of deposition is generally not much greater than a mono-molecular layer when due to straight adsorption. Since the mechanism of such protection also involves the interaction of the cationic molecule with a bentonitic clay group, a further demand is presented which must be considered. Through such technique it is possible to achieve a higher degree of success in flooding a reservoir which has a clay problem. The Orchem-400 series has been developed to serve this function.

This operational procedure has been applied, in part, to a water-flood project in Winkler County, Texas. The reservoir being flooded is the Queen sand. Laboratory work on cores established that this sand had a bad clay condition. Cores, on contact with the flood water, would swell shut and in several cases crack open even though they were entirely encased in plastic except for the inlet and outlet ports. It was established that the bentonite clay was apparently layered in streaks throughout the pay zone. In a normal operation, water would travel through the cleaner sand sections, but would not move in the sections which contained greater amounts of bentonite clays because they would be plugged by swelling. By applying the above mentioned technique, involving the use of a strong acid together with Orchem-400 in the flood water, it was possible to maintain good injection rates and to conclude that perhaps more of the sand section was taking water than would be possible with a conventional operation.

The feasibility of increasing water injection rates without increasing injection pressures has been demonstrated in at least two field operations. This may be accomplished with some measure of success by using certain combinations on non-ionic surface-active agents. The right time to use this technique is at the beginning of the injector program while the reservoir is in its normal unaltered condition.

Water can be a blessing or a curse depending on its end results.

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[2]Starkey, R. L., and K. M. Wight, "Anaerobic Corrosion of Iron in Soil," final report of the American Gas Association Iron Corrosion Research Fellowship, American Gas Association, 1945, p. 7.

[3]Williams, O. B., "Little Bugs—Big Problems," *World Oil*, June 1953.

[4]Morgan, O. O., J. H. Prusick, and Paul D. Torry, "Application of Surface Chemistry to Oil Recovery," *Producers Monthly*, Vol. 16, No. 9, July 1942, pp. 18-24.

PETROLEUM CHEMICALS DIVISION
NEWS

March ★ One of a Series of Interest to the Petroleum Industry ★ 1954

"Cavalcade of America" Films Available For Oil Company Use

The story of men and women who helped to shape the dynamic, adventurous growth of America has been brilliantly dramatized on film for Du Pont's television series, "Cavalcade of America."

So far, more than 30 of these historical-interest films have been produced. Their subjects range all the way from the Louisiana Purchase to "Teddy" Roosevelt's early days in the Dakota badlands . . . from pirate Jean Lafitte's part in the defense of New Orleans to Samuel F. B. Morse's invention of the telegraph.

Many of the films deal with the people—and their ideas—who laid the foundation for our tremendous industrial progress. For example, the story of how Eli Whitney became the first mass production manufacturer of firearms . . . how Samuel Slater became the father of the American factory system . . . and how Tom Davenport, a blacksmith, created the first electric motor.

These 28-minute films are ideal for public relations showings. You may also find them useful for entertainment at dealer meetings. Any Du Pont Petroleum Chemicals Division representative or regional office will be glad to help you obtain any of these films on a loan basis.

SALES PROMOTION MANAGER

ROBERT F. HARWICK joined the Du Pont Company in 1950 and was appointed Sales Promotion Manager of the Petroleum Chemicals Division the following year. He brought to this job a broad oil industry experience—ranging all the way from manufacturing to editorial work with a petroleum publication.

ROBERT F. HARWICK

In 1934, Mr. Harwick started with the Gulf Refining Company as a unit operator at their Girard Point Refinery. He was later transferred to the Company's advertising and sales promotion staff at Pittsburgh. In 1948, he joined the *Oil and Gas Journal* as West Coast editor.

At Du Pont, he has been in charge of such customer service projects as the Brand Name Program and the Survey of Consumer Gasoline Buying Habits.

A graduate of Drexel Institute with a B.S. degree in Chemical Engineering, Mr. Harwick served for four years with the U. S. Army during World War II.

Do Service Station *Services* Help Increase Dollar Sales?

Report No. 6 of Du Pont's continuing Survey of Consumer Gasoline Buying Habits points up the relationship between dealer services and volume of product sales

Changing the vocabulary of millions of motorists is a tough job. But gasoline marketers have been highly successful in doing it. What was once known as a "gas station" or "filling station" is today thought of and referred to as a "service station."

In accomplishing this name change, service has become an important part of gasoline marketing. But does it pay off in sales? Report No. 6 on Du Pont's extensive Survey of Consumer Gasoline Buying Habits contains statistics to take the answer to this question out of the "hunch" category.

THE IMPORTANCE OF SERVICE as a service station sales stimulant is highlighted in Report No. 6 of the Du Pont Survey of Consumer Gasoline Buying Habits.

Report No. 6 covers specifically services given by dealers and services wanted by the motorist. Based on 3,100 household interviews and 21,000 observations at 1,193 service stations, the survey was conducted by National Analysts, Inc. It is countrywide in scope.

Importance Of Oil Check

All of the motorists interviewed were asked what they considered the *most important* dealer service. *Oil check* was the answer given by more than 90% of them.

And the station observations showed that the more often oil was checked by the station attendant, the more often oil was sold. Yet only a small percentage of the total number of customers were *offered* an oil check. Many of

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OVER

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PETROLEUM CHEMICALS DIVISION
NEWS

DU PONT

CONTINUED *Service Survey*

them *had to ask* for it. And the largest percentage of motorists neither asked for nor were offered an oil check.

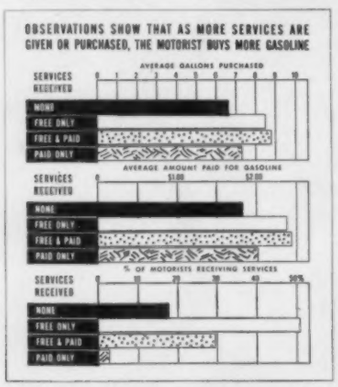
Who Was Offered An Oil Check?

Owners of newer and more expensive cars were offered the oil check more frequently than owners of older cars. Yet, the chances are that the older cars are more likely to need additional oil between changes . . . and therefore represent a greater potential market for oil.

In addition to oil check, Report No. 6 covers consumer attitudes toward many other important dealer services —both free and paid. You'll find in it detailed information on the number of motorists who *expect* to have their windshields cleaned with every stop . . . how many motorists would like to have tire pressure and battery water checked more frequently . . . and even the relationship of these services to tire and battery sales. It also contains data on paid services . . . plus data on the stimulating effect of these services on sales.

Sales-Service Ratio

The station observations show that the motorists who received the most service purchased the most gasoline. On the

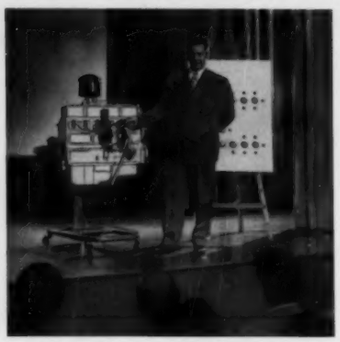


A TYPICAL CHART from Report No. 6 shows the relationship between free and paid services and gasoline sales.

average, motorists who received free service bought 2 gallons of gasoline more than those who received no service at all. And those who received paid service purchased, on the average, slightly less than one gallon more than those who received no service at all.

Engineering Talks On Automotive Service Problems

As an aid to oil company fuel and lubrication engineers, personnel from the Technical Section of the Du Pont Petroleum Chemicals Division are prepared to conduct a technical conference on automotive service problems.



The conference is designed for those directly concerned with the performance of fuels and lubricants in the field. And it is expected that the material covered in the conference will prove extremely helpful to these engineers in answering customer complaints involving service problems.

Broad Range Of Topics

Five important topics are covered in the conference: 1. exhaust valve burning; 2. induction system deposits; 3. road testing of gasoline; 4. ignition system and spark plug fouling; 5. engines and their octane requirements. The individual talks range in length from 35 to 50 minutes. And the complete conference takes about half a day.

The fundamental principles underlying the specific operating problem are covered in each talk. The speakers use these principles to explain the problems in a manner which suggests methods of assuring trouble-free operation.

Experienced Speakers

Each talk is given by a well-qualified member of the Petroleum Chemicals Division's technical staff. All have had years of experience in their respective subjects in the Du Pont laboratories, in oil refineries and in technical service activities.

The talks, however, are informal and easy to follow. Each speaker is well trained in public speaking. And the talks are amply illustrated with colored slides.

Available To Oil Companies

This conference is available to any oil company. And it may be scheduled for any time at a location most convenient for the audience. If you are interested in obtaining the conference for your automotive service group, you may request it from any Du Pont Petroleum Chemicals Division regional office or representative. To insure that all speakers are available, we suggest that you make arrangements well in advance.

Complete Information Available

In addition to Report No. 6 which is now being distributed to marketing executives, the full and complete information collected by this survey on services is recorded on IBM cards. This information can be cross tabulated to provide seasonal, regional, and other specialized breakdowns. These cross tabulations are available to oil company market research groups through the Petroleum Chemicals Division's Wilmington office.

The Survey of Consumer Gasoline Buying Habits is part of a continuing Du Pont marketing study program. Work is already under way on a new study which will contrast dealer attitudes and beliefs with those of consumers.

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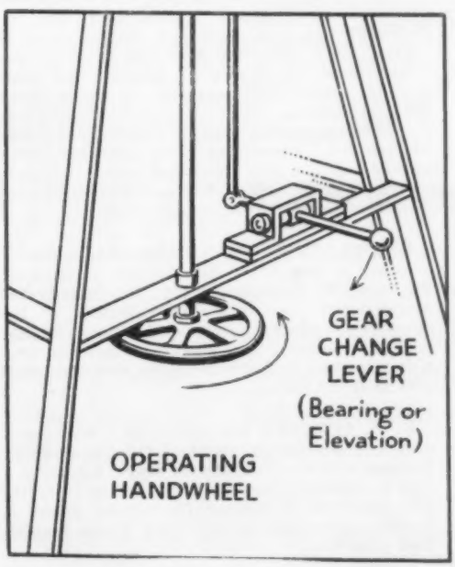
Pyrene TRADE MARK

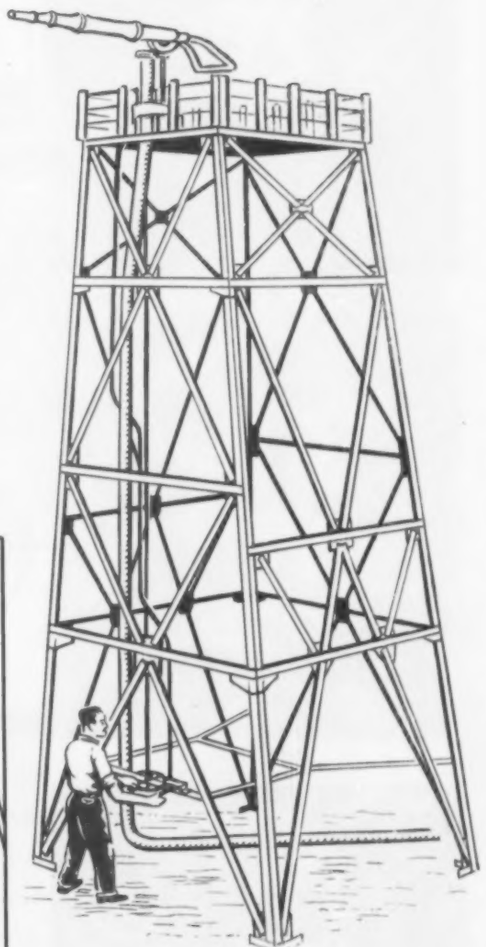
Remote Control FOAM MONITORS

Movement of the Monitor through the vertical and horizontal planes is obtained by operating the controls shown in the diagram, on the right.

The free and impartial advice of Pyrene Fire Engineers is always available to assist you with your fire problems, or illustrated literature will gladly be sent on request to Dept. WP-3.

The application of Mechanical Foam in great volume, from a position above ground, may now be achieved with ease and safety with a "PYRENE" Foam Monitor mounted on top of a fixed steel tower. The Monitor is, in itself, a complete foam producing unit connected to a simple system of gearing and extended controls that enables it to be operated at ground level by the manipulation of a handwheel and a control lever. The Monitor is fitted to a platform at the top of the tower where it is permanently coupled to a dry riser into which is introduced a premix solution of foam-making compound and water. This type of Monitor is recommended for oil installations and in particular oil jetties.





This diagram shows how the Pyrene Remote Control Foam Monitor is operated from ground level by means of extended controls.

THE PYRENE COMPANY LIMITED

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OIL COMPANY STAFF CHANGES

W. W. White

H. W. Fisher

John Wach

Dr. H. G. Burks, Jr.

WILLIAM J. CARTHAUS has resigned as vice president of Deep Rock Oil Corp. to become president of Great Northern Oil Co. His headquarters are at St. Paul, Minn.

Great Northern is planning to build a refinery on the Mississippi River in the Twin Cities area. Construction is to begin this spring with completion anticipated late in 1955.

Woodley Petroleum Co. and Southern Production Co., Inc., are the principal stockholders of Great Northern. A ten years' supply of medium gravity Saskatchewan crude oil has been committed to the refinery by Socony-Vacuum Exploration Co., Woodley Canadian Oil Co., and Southern Production Co., Inc., at the rate of 20,000 barrels per calendar day.

Officers of Great Northern in addition to Mr. Carthaus are: Marlin E. Sandlin, vice chairman and secretary; J. E. Vaeth, vice president; J. Howard Marshall, vice president; H. T. Ellwood, treasurer; and J. B. Cook, assistant treasurer. C. R. Chenery and Sylvester Dayson are directors.

KENNETH G. MACKENZIE, on completion of 43 years' service with The Texas Company, retired on February 28 and announced the opening of offices as a consultant at Westport, Conn. He has been closely associated with the technical progress of the company since its early years and until recently was assistant to the vice president in charge of refining, vice president of Texaco Development Company and chief technologist of The Texas Company. Aside from his company service, Mr. Mackenzie has been an active member and officer of many scientific and technical societies and has won recognition as a leading authority on the technical problems of petroleum. He had a prominent part in the Third World Petroleum Congress held in The Hague in 1951, and will retain his position as Secretary of the United States National Committee for the Fourth World Congress to be held in Rome in June 1955.

DR. ARTHUR PHILIP LIEN, research chemist of the Standard Oil Company (Ind.), will receive the $1,000 Precision Scientific Co. Award in petroleum chemistry in Kansas City, Mo., on March 27, it is announced by Professor Harry L. Fisher, president of the American Chemical Society, which administers the award. The prize will be presented during the society's 125th national meeting. Dr. Lien has developed processes for separating complex mixtures of hydrocarbons and for removing sulfur compounds from petroleum. He has published many scientific papers in the petroleum field and is credited with 35 patents.

DR. MILLER W. SWANEY has been appointed director of the Enjay Laboratories division of Standard Oil Development Co. Dr. Swaney has served since 1947 as assistant director of the development company's chemical division in Linden, New Jersey. The laboratory staff will provide sales technical service in the chemical products field for Enjay.

B. W. LETCHER has retired as a vice president and director of Standard Oil Co. of Calif. He was with the company 43 years, becoming a vice president in 1944 and a director in 1949. He also has been a director for several years of Arabian American Oil Co. and Trans-Arabian Pipe Line Co.

ALLAN J. WELLIVER has been appointed manager of Sun Oil Company's general wholesale department to succeed Percy V. Kane, retired. Mr. Welliver has been assistant manager of the department since 1945. K. E. DeRosay was made manager of a newly-created fuel oil department.

W. W. WHITE, a vice-president, director and general manager of the aviation department of Esso Export Corp., has accepted an extended assignment for active duty with the United States Air Force. He has been granted a leave of absence for a year during which he will be staff director for petroleum logistics for all branches of the armed forces. Shepard Dudley, assistant general manager, has been appointed acting general manager of Esso's aviation dept.

HAROLD W. FISHER, coordinator of the world-wide refining activities of Standard Oil Co. (N. J.), has been appointed shareholders' representative for Jersey affiliates in the United Kingdom and chairman of the company's European coordination committee with headquarters in London. He succeeds Howard W. Page, who became a director January 1. Mr. Fisher joined the Jersey Standard organization in 1927 at the research laboratories of Esso Standard Oil Co. in Baton Rouge, La.

In 1935 Mr. Fisher became assistant director of the Esso laboratories, where he supervised extensive developments and research on fuels, lubricants and chemicals. The following year he was appointed manager of the newly-formed chemical products division and in 1945 was elected a director of Esso Standard. From 1948 to 1949, when he joined Jersey Standard as deputy coordinator of refining activities, Mr. Fisher was manager of Esso Standard's East Coast refineries. He became coordinator in 1950.

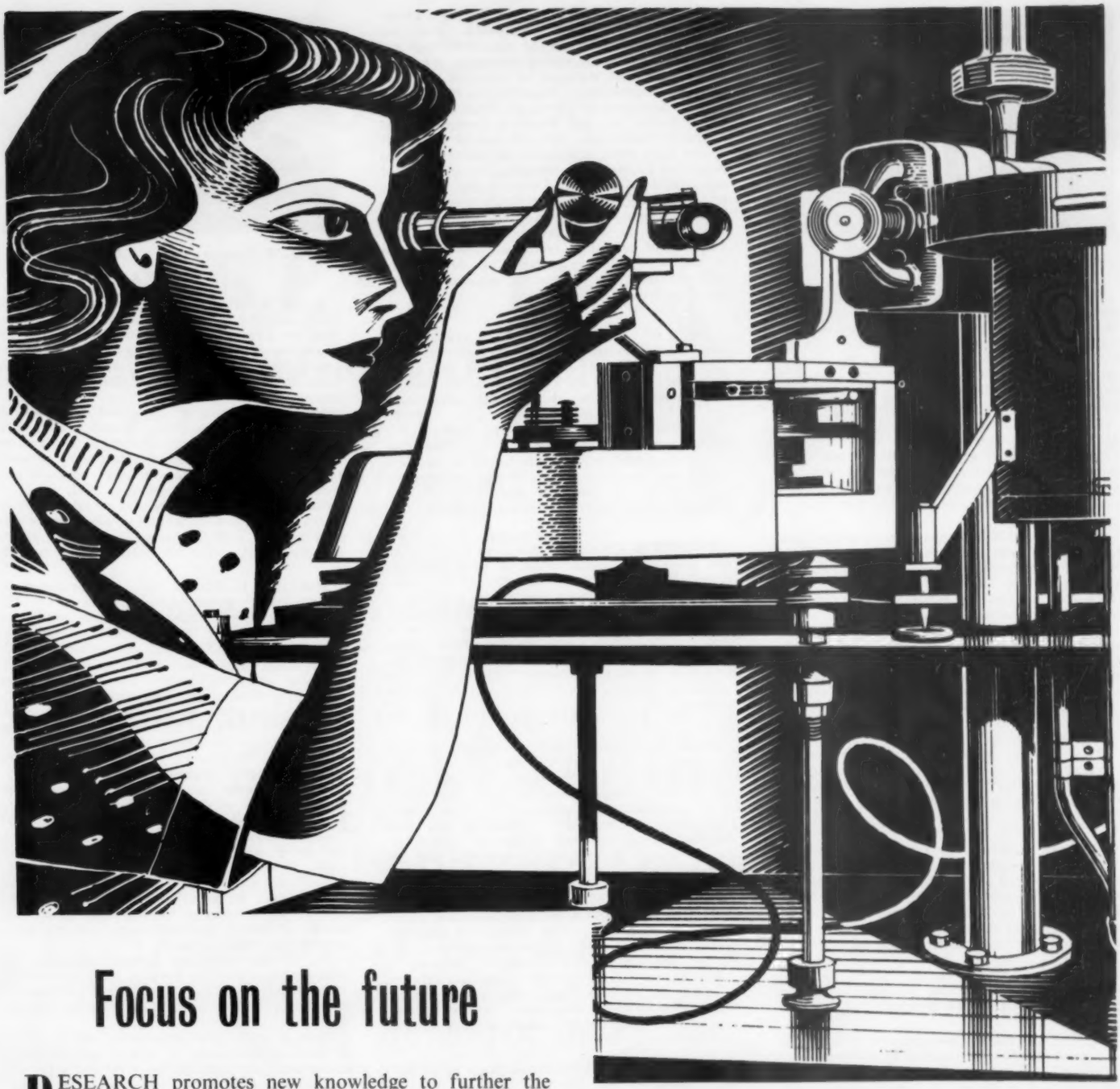
Jersey Standard has also announced the appointments of Paul J. Anderson as deputy shareholders' representative for United Kingdom affiliates, and D. E. Stines as vice chairman of the European coordination commitee. Mr. Anderson has been the company's representative on the board of directors of the Iraq Petroleum Co. and affiliated companies and Mr. Stines the Jersey company's economics representative on the European coordination committee since January 1953.

JOHN WACH, formerly operations superintendent at the British American Oil Co. Ltd. refinery at Montreal East, has been appointed superintendent of the Royalite Products Ltd. 5,000-barrel refinery now nearing completion at Kamloops, B. C. Mr. Wach, who is a graduate of the University of Manitoba, has had wide experience in the refining phase of the oil industry. He has already assumed his duties at Kamloops.

CAPTAIN RICHARD SCHWARZ, master of the *S. S. David McKelvey* and Captain Stanley Matthews, master of the *S. S. Robert E. Hopkins,* retired recently from Tide Water Associated Oil Co. after completing nearly 27 years of service each. Both masters joined the company in 1927 as mates.

DR. HARRY G. BURKS, JR., the executive vice president of Esso Standard Oil Company, has been named coordinator of the world-wide refining activities of Standard Oil Co. (N.J.). He succeeds Harold W. Fisher, who recently was appointed shareholders' representative for Jersey affiliates in the United Kingdom and chairman of the company's coordination committee for Europe.

Dr. Burks, who is also a director of Standard Oil Development Co., joined the Jersey Standard organization in 1924 as a development engineer at the Bayway refinery. In 1943 he was elected a director of Esso Standard and, in 1946, became general manager of East Coast manufacturing operations. He became executive vice president in 1949. A veteran of World War I, Dr. Burks served in World War II with the Petroleum Administration for War.



Focus on the future

RESEARCH promotes new knowledge to further the wide activities of Anglo-Iranian Oil Company. Knowledge that means new uses for oil; new efficiency in refining; new economy in operation.

Plant and equipment keep pace with this progress. Anglo-Iranian now has three cat-crackers in operation in Britain; two more than any other company. Six platformers are being installed at the Group's refineries throughout the world. Two new refineries are being built; one at Aden and one at Kwinana in Western Australia.

Hundreds of specialists at its Research Stations are keeping Anglo-Iranian in the forefront of the world petroleum industry.

THE BP SHIELD IS THE SYMBOL OF THE WORLD-WIDE ORGANISATION OF

Anglo-Iranian Oil Company

LIMITED

J. E. Dyer

C. J. Allen

JAMES E. DYER, vice president and director of marketing, has been elected president of Sinclair Refining Co., succeeding P. C. Spencer, who will continue as president of Sinclair Oil Corp. C. J. Allen, vice president, has been elected executive vice president of the refining subsidiary succeding M. L. Gosney, who will continue as executive vice president of the parent company.

Other promotions include the election of S. H. McManus, assistant comptroller of Sinclair Oil Corp., to the post of comptroller, Sinclair Refining Co.; promotion of E. H. Mutz to treasurer; and of T. A. McKearney to succeed Mr. Mutz as assistant treasurer, Sinclair Refining Co.

PHILIP S. JUSTICE has been appointed general manager of Sun Oil Company's Rocky Mountain production division with headquarters at Denver. He has been a member of Sun's three-man management commitee controlling the company's Gulf Coast division.

Donelson Caffery, another member of the management committee, was appointed general manager of the Gulf Coast division. Joiner Cartwright, the third member of the management committee (now dissolved), has been given increased responsibilities as general counsel of the division. He will continue as an assistant secretary of the company.

Mr. Justice succeeds J. E. Regent, who is recovering from a long illness. Mr. Regent will return to Dallas, his former home, as special assistant to the management of the southwest division.

CARL O. TONGBERG has been named coordinator of research and development on products for Standard Oil Development Co. He was previously director of the research division of Esso laboratories. He will now be responsible for the company's world-wide activities on research and developments on petroleum products. Charles L. Fleming, Jr., formerly associate director of research, became the director of the division and John G. McNab, formerly assistant director, became associate director.

PAUL CARVER has been named manager of the land department of General Petroleum Corp., according to an announcement by P. S. Magruder, executive vice president of the company. He succeeds B. A. Otis, who has retired after 28 years with General Petroleum. Parke W. Jackson succeeds Mr. Carver in the post of assistant manager of the land department.

P. Carver

P. W. Jackson

B. M. DOWNEY, manager of the Shell Chemical Corporation's plant at Houston, Tex., has been appointed manager of manufacturing and A. W. Fleer, manufacturing operations manager, has been named manager of research, development and engineering. Reporting to Mr. Downey will be managers of plants at Houston; Denver, Colo.; Norco, La.; and Martinez, Dominguez and Torrance, California. He will also be in charge of the head office manufacturing operations and industrial hygiene departments. As manager of research, development and engineering, Mr. Fleer will be in charge of the company's research, economic evaluation and process engineering activities as well as the engineering, design and construction of new plant facilities. The managers of the head office manufacturing development and manufacturing engineering departments will report to him.

JOHN G. CAMPBELL has been promoted to vice president, marketing, of Deep Rock Oil Corp. and Wm. M. Murray has been made vice president, direct sales. Mr. Campbell moves into his new position from the post of general sales manager.

Mr. Murray, a 25-year company veteran, will be in charge of bulk sales to compounders, refiners, marketers and manufacturers in both domestic and foreign markets. He will also handle sales of branded products distributed through channels other than the company's jobbers.

ROBERT M. CHESNEY has been promoted to vice president, manufacturing, of Deep Rock Oil Corp. He was formerly manager of the company's Cushing, Okla., refinery. In addition to overseeing refinery operations, he will assume new administrative responsibilities and will be in charge of Deep Rock's pipe line operations. Operating headquarters of the pipe line department, with J. H. Tubbs as manager, will continue to be located in Tulsa. Mr. Chesney will remain at Cushing.

JOHN L. FERGUSON has resigned as vice president of Deep Rock Oil Corp. to enter the consulting field. He will bring to the solution of exploratory problems over 25 years' experience in the coordination of geological and seismic data. Deep Rock will be his first client in this new venture and will continue to have the benefit of his knowledge of exploratory problems for an extended period.

AARON B. BAGSAR, chief metallurgical engineer of Sun Oil Co., retired February 1 after 22 years' service. He was succeeded by Joseph E. Carney, assistant chief metallurgical engineer.

Mr. Carney joined the Sun metallurgical department in 1934 and was subsequently named chief inspector of the department. In 1951 he was appointed assistant chief metallurgical engineer.

LELAND L. CHAPMAN has been appointed chief patent counsel for the Standard Oil Co. (Ohio), a new post. He has had 20 years' practice in New York with the firm of Campbell, Brumbaugh, Free & Graves and its predecessors, where he has been engaged in all phases of patent work.

FRANCIS W. STECKMEST, personnel director of the Shell Development Co. research center at Emeryville, Calif., has been appointed manager of the employee publications department of Shell Oil Co. in New York. He joined Shell in 1947 at Emeryville as assistant personnel director.

CAPTAIN LOUIS C. McKAY, a 17-year veteran of the marine department of Pan American Petroleum & Transport Co. and its affiliate, the American Oil Co., has been named marine superintendent. He succeeds Verne N. Drew, who recently was named marine operating manager. Captain McKay started with the company in 1936 as a second mate and in 1948 was appointed its port captain in New York. His headquarters will be in New York City.

B. M. Downey

A. W. Fleer

H. E. HANDY has been appointed to the newly-established position of manager of The Ohio Oil Company's Robinson, Illinois, refinery. He has been refinery superintendent for the past seven years. D. L. Winsett, assistant refinery superintendent, succeeds Mr. Handy as refinery superintendent.

Mr. Handy recently completed 30 years of service with The Ohio Oil Company, most of it at the Robinson refinery. Following work as an engineer in the production department, he went to Robinson in 1926 as a refinery engineer and became refinery superintendent in 1947.

Mr. Winsett joined Transcontinental Oil Co. in 1925 and came to Ohio when Transcontinental was purchased in 1930. He was appointed assistant superintendent at the Robinson refinery in 1939.

WILLIAM R. STOTT has been appointed coordinator of marketing by Standard Oil Co. (N.J.), and Dyer W. Ramsey, Jr., has been named deputy coordinator. Both are veteran sales executives of Jersey Standard and affiliates.

Mr. Stott began his career as a petroleum products salesman in 1929 and has served as deputy coordinator since last August. Mr. Ramsey, who joined the Jersey organization in 1928, has been an assistant coordinator of marketing since 1951. In his new position Mr. Stott succeeds Peter T. Lamont, whose election to the board of directors became effective January 1.

Before joining the marketing coordination staff, Mr. Stott served 22 years in the marketing divisions of Esso Standard Oil Co., affiliate of Jersey Standard. Immediately before joining the Jersey company in 1952 he was northern region sales manager for Esso Standard.

Mr. Stott started with Esso Standard in the Pennsylvania division. In 1930 he joined the New Jersey division at Newark and successively served as district manager, merchandising manager and division manager.

Mr. Ramsey joined the Jersey organization in personnel and training work in 1928, and shortly after transferred to a marketing affiliate at San Juan, Puerto Rico, and subsequently to Trinidad.

Through successive promotions and transfers in the Caribbean area, he rose to vice president and general manager of the West India Oil Co. In 1943 he joined Jersey Standard as a special representative in North Africa and later in Switzerland. In 1948 he returned to the United States as a deputy marketing advisor for the Eastern Hemisphere, and in 1951 became assistant coordinator of marketing.

W. R. Stott

D. W. Ramsey, Jr.

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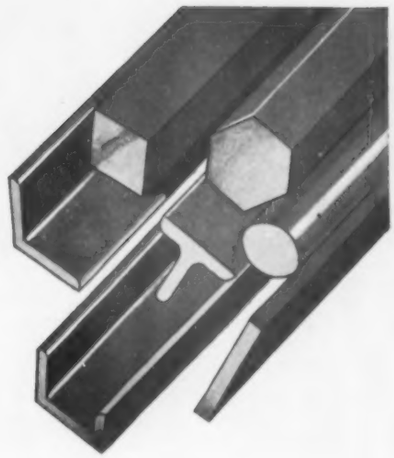

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J. E. Heston

J. E. HESTON has been elected vice president and director of Cities Service Oil Co. (Del.) He has been coordinator of oil production for Cities Service in New York. He is a director of Canada-Cities Service Petroleum Corp.

CHARLES M. BROOKS has been named director of industrial relations for The Texas Co. He has been staff attorney in charge of labor law.

W. H. Barlow

R. W. HALL has been appointed director of technical service for the technical and research division of The Texas Company. For the past ten years he has been the technologist in charge of the division's Houston office. Previously he had been in the Lockport, Ill., and Beacon, N. Y., laboratories. Succeeding Mr. Hall in Houston is O. P. Puryear, assistant to the director of technical service in New York.

B. F. Koepke

J. R. KEITH has been appointed assistant general manager of the refining division of California Texas Oil Co. Ltd. He has been with Caltex since 1937 and previously was with The Texas Co. Mr. Keith's new position in the company's head office in New York is the latest step in nearly 25 years of refining research and administrative assignments.

A. W. WILLISCH, sales representative for Deep Rock Oil Corp. in the Milwaukee area, has been made district sales manager of the company's western district with headquarters in Des Moines. He succeeds Ralph Heuring, who has been named jobber sales manager.

A veteran employee with 30 years of sales experience with the company, Mr. Willisch joined Deep Rock in 1924 in the company's wholesale department in Chicago. He was named assistant manager of this department in 1931 and later became manager before shifting to Milwaukee as assistant division sales manager. In 1948 he was promoted to division sales manager.

WILFRED O. TAFF and Neil V. Hakala have been appointed assistant directors in the Esso laboratories of Standard Oil Development Co. Mr. Taff will be responsible for research and development on new fuels processes. Dr. Hakala will be responsible for research on automotive fuel quality and combustion problems on automotive engines.

W. H. BARLOW, assistant chief petroleum engineer, has been made manager of the newly-established research department of The Ohio Oil Company to carry out a long-range program of petroleum research, according to an announcement by J. C. Donnell, II, president. Initially, problems in production and exploration will be the main fields of interest of the new department. Mr. Barlow worked for Phillips Petroleum Co. and the U. S. Bureau of Mines before joining Ohio in 1942. He became assistant chief petroleum engineer in 1952.

GEORGE T. NAFF has been elected president of Texas Eastern Transmission Corp. to succeed the late R. H. Hargrove. He has been executive or first vice-president of the company since January 28, 1948.

JAMES J. NANCE, president of Packard Motor Car Co., has been elected to the board of directors of Standard Oil Co. (Ohio).

Mr. Nance was born at Ironton, Ohio, and attended Ohio State University and Ohio Wesleyan University, from which he was graduated. He is vice president of the board of trustees of Ohio Wesleyan and was recently honored at the "Native Sons Luncheon" at which Governor Frank J. Lausche presided as a major event of the Ohio Sesquicentennial.

BOYD F. KOEPKE, associated with the petroleum industry for more than 30 years, joined Universal Oil Products Co. the first of the year. He will be UOP sales representative to refiners and manufacturers of natural gasoline in the Midcontinent and Gulf Coast areas.

ALFRED B. HECKER has been appointed general auditor by Standard Oil Co. (N.J.). He succeeds W. H. Dickie, who has retired after 40 years with the Jersey organization.

Born in St. Louis, Mo., Mr. Hecker received most of his education in England. He entered into accounting work immediately after graduation from Christ's College, London, in 1924, and subsequently served with Price Waterhouse & Co. in Belgium, France, Italy, Romania, Sweden and Venezuela before coming to the United States in 1940.

Mr. Hecker joined Jersey Standard in 1942 as assistant to the general auditor. During World War II, he was with the U. S. Army as deputy chief accountant with the Allied control commission in Italy and later as chief accountant in Austria.

J. R. Keith

W. H. QUAY, sales manager of the eastern Pennsylvania marketing region of The Atlantic Refining Co., has been transferred from the company's regional headquarters in Reading to the main office at Philadelphia to serve as special merchandising assistant. He will succeed P. J. Sturgeon, who returns to Pittsburgh as sales manager of the company's western Pennsylvania marketing region.

G. T. Naff

ROBERT A. BISHOP has been appointed manager of Ohio Petroleum Company, Canadian operations, replacing Brame Womack, who was transferred from Regina and Oklahoma City. Prior to his present position, Mr. Bishop was division geologist at Billings, Montana. The post vacated by Mr. Bishop is taken by Walter Johnson, who formerly was stationed in Lewistown, Montana.

A. B. Hecker

"In the United States alone, there has been produced since 1938 as much oil as was known to exist in the country at that time. And despite that great withdrawal, the domestic industry's proved reserves are at an all-time high level. It's as though we started out with a tank of oil, used it all up, and had a bigger tankful left."

STANDARD OIL COMPANY (NEW JERSEY)
AND AFFILIATED COMPANIES

Lift truck operator is arranging four oil drums in order to pick them up neatly with the new gripper arms developed by Shell Oil Co.

New Materials Handling Method

Development of a new type of gripper arm for lift trucks, which can revolutionize the way industries handle, transport and store materials, has been announced by Shell Oil Co. The device is hailed as the key, sought for a quarter-century, to the handling of materials without using the customary wooden pallet. The new handling method differs from conventional fork-lift truck operations in that gripper arms grab loads from the sides so that no bottom support is needed.

Development of the arms started several years ago as a project of Shell's marketing operations department. The Elwell-Parker Electric Co. of Cleveland, Ohio, constructed the attachment, through several phases, under Shell's guidance. Shell's major use of the new attachment is in handling drums and packages. The same set of arms can handle both types of loads, giving the device wide versatility.

Friction, uniformly distributed over a relatively large area, rather than localized pressure, provides the main force with which Shell arms lift a load. This improvement allows the handling of larger loads without crushing. The lifting effectiveness of the friction factor is raised by special shaping of arms plus corrugated facings where they come into contact with a load.

Shell's arms are flexible and are shaped to provide, for the first time, a sufficiently firm grip to hold loads safely despite abrupt stops. Previously, loads tended to slip forward and fall when sharp stops were made.

Heat Exchanger Calculator

A heat exchanger calculator for use in the selection of shell-and-tube type heat exchangers has been prepared by the Young Radiator Co., Racine, Wis. Designed like a slide rule, the handy 2-color calculator provides all necessary data. Essentially, the calculator is used to determine the square feet of surface necessary to transfer a given amount of heat between oil or water on the shell side, and water on the tube side.

Book Review

Economics of Natural Gas in Texas, by John R. Stockton, Richard C. Henshaw, Jr., and Richard W. Graves; Bureau of Business Research, University of Texas; $5.

For this comprehensive discussion of natural gas economics, the Bureau of Business Research has prepared 60 illustrations and 90 separate tabulations showing those data and facts which best tell the story of the natural gas industry. This book was written with the aim of presenting a comprehensive factual treatment of the economic problems facing the natural gas industry. It contains eleven chapters in which the following major subjects are discussed: history and nature of natural gas, utilization of natural gas and natural gas liquids, chemical manufacture of synthetics from natural gas, production, reserves, transportation, taxation, public control, conservation, competition with other fuels, and a summary chapter.

Book Review

"Swedish Shale Oil, O.E.E.C. Documentation, Technical Assistance Mission No. 93"; published by Organization for European Economic Co-Operation, 2, rue Andre-Pascal, Paris 16; 65 pages with numerous illustrations; $2.00.

This is the report of a technical committee of the O.E.E.C. which was invited to make a study of the operation of new methods for the production of shale oil at Kvarntorp, Sweden, with the idea of compiling information that could be of interest to the 16 countries that have extensive deposits of oil shale. The committee, which included experts from Austria, Belgium, Germany, Luxembourg, Norway, The Netherlands, Turkey and the United Kingdom, has here presented a detailed description of the Kvarntorp operations, methods of mining, shale handling, the types of retorts used, refining of the shale oil and the general economics of the process. The cost of bringing the shale to the retorts, including interest and amortization, is given as $0.47 U. S. The overall cost of the crude shale oil is 5.83 d. per Imperial gallon. Total production in 1952-1953 is estimated at 214,000 tons. Since 1951, the project has been making a small profit. When arrangements for expansion in output are completed, it is expected that profits will increase.

Purchases Drilling Company

The formation of Century Drilling Corp. has been announced by Ben F. Rummerfield, vice president of Century Geophysical Corp., Tulsa. The Rayburn Drilling Co., a seismic shot hole drilling company, was purchased by Century, and Floyd M. Rayburn, president of the former company, will manage the new drilling company as supervisor of drilling operations.

To Enlarge El Paso Plant

The Texas Co. will double the capacity of its El Paso, Texas, refinery. Included in the work to be done is the installation of a 10,500 b/d atmospheric crude still, a fluid catalytic cracker, catalytic reformer, delayed coker and cat poly unit. A new boiler plant, laboratory and warehouse will be erected. Storage will be expanded. Foster-Wheeler Corp. is major contractor. Completion is scheduled for late 1954.

Cooper-Bessemer Expands Chicago Office

R. L. Moore has been appointed sales engineer in the Chicago office of The Cooper-Bessemer Corp. Working under the direction of Charles L. White, district manager, and Robert Bowie, Chicago office manager, Mr. Moore will devote his efforts to the engineering and sales of diesel and gas engines, air and gas compressors for manufacturing and chemical operations in the Midwest.

R. L. Moore

J. A. Cameron

Cameron to Executive Position with Marley

J. A. Cameron has been appointed executive vice-president and assistant general manager of The Marley Co., manufacturer of water cooling towers and other cooling equipment for industry and air conditioning. Mr. Cameron has been with Marley since 1937, at which time he served as a sales engineer in their New York office. In 1944, he was made a vice-president and in 1952 a director.

Aromatics Booklet

Universal Oil Products Company, Des Plaines, Ill., has prepared a booklet dealing with the production of aromatics through Platforming. The booklet describes the problems which confronted designers of the process and how these were met. An extensive bibliography is included.

New Graver Office

Graver Tank & Mfg. Co., Inc. has opened a new office at Atlanta, Georgia. The new office is under the supervision of John R. O'Connor and has as territory the states of Tennessee, North Carolina, South Carolina, Georgia, Alabama, Mississippi and Florida.

Book Review

"Oil Refining and Drilling in the U.S.A., Report of Technical Mission, Mission No. 68"; Published 1952 by Organization for European Economic Co-Operation; 267 pages; $5.00.

This is a report by a commission of European petroleum experts which was sent to the United States to study American methods. While giving a general account of American processes, the Mission paid particular attention to methods which could be introduced with benefit into the European oil industry. In comparison with Americans, Europeans are not sufficiently proficient in the recovery and utilization of L.P. hydrocarbons, aviation gasoline or petrochemicals. Alkylation, which is essential for production of 115/145 O.N. gasoline, is said not to exist in Europe, and more attention could be paid to recovery of sulfur from refinery gases.

Thermal cracking and reforming processes are still widely used in Europe, but in the U. S. very few such plants have been built since the war, but are still considered essential for feedstock preparation and up-grading of cycle stocks. The mercaptan-extraction processes should be very useful in the treatment of certain Middle-East crudes. The production of high-quality lubes is much more advanced in the U. S., and European manufacturers could well engage in more research in this line and in the use of oxidation inhibitors.

Handling and storage of oil products is much more efficient in America, and the Europeans are not taking full benefit of the use of instrumentation. Numerous other details that could well be carried across the Atlantic are dealt with.

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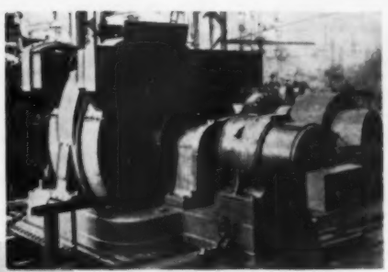
PLAY A VITAL PART IN KEEPING THE OIL FLOWING

In the blinding desert dust storms which sweep the area of the Iraq pipelines, VOKES filters have twice been chosen for the important task of protecting pumping stations and ancillary equipment . . . proof indeed of the important part which VOKES filtration is playing throughout the world in safeguarding plant and machinery from wear, breakdown and unnecessary depreciation.
Below are shown three typical aspects of VOKES protection . . . protection which cannot be jeopardized by the non-availability of element replacements because VOKES FILTERS ARE CLEANABLE.

MICRO-VEE PANEL FILTERS FOR ELECTRIC MOTORS

Electric motors breathe too! . . . and these VOKES filters have proved conspicuously successful in preventing the grave damage hitherto sustained during operations in impure air conditions.



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Compressors . . . portable generators . . . welding sets . . . power packs . . . all need protection against the ingress of abrasive dust, whether by air-intake, lubricating oil or fuel.

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The range of VOKES filters for air conditioning includes the Micro-vee Dry Fabric Panel Type Air Filter, which has an initial pressure drop of only 0.25" W.G. at standard ratings and can be serviced with the utmost speed and simplicity.

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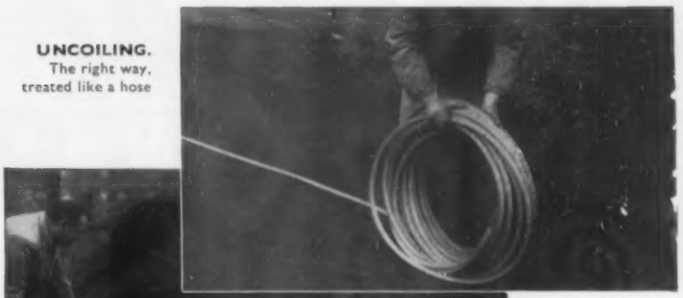

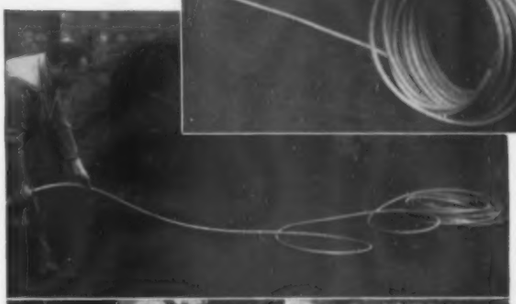

— nd the wrong way

UNREELING. The right way, reel rotating freely

—and the wrong way

Good rope repays care in handling. Never allow kinks to form when UNCOILING or UNREELING a steel wire rope. Treat it like a hose pipe. A light coil of rope may be unrolled along the ground but should always be kept under control. A reel may be placed on a turntable or mounted on stands and supported by a bar or tube through the hole in its centre. In no case should a coil or reel be laid on the ground and the end taken over; kinks will inevitably form and the rope's life and efficiency be seriously reduced. When COILING down a rope always put in under-turns as required to counteract the tendency of the rope to twist itself. Under-turning is simple — the rope itself will indicate that.

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HERSCHEL Y. HYDE, vice-president in charge of manufacturing for the western division of Tide Water Associated Oil Co., has been assigned the responsibility of planning and developing programs for all refining divisions of the company, according to an announcement released by President David T. Staples. Mr. Hyde, a graduate of the University of California and Massachusetts Institute of Technology, has been in the service of Tide Water Associated for 26 years, commencing as a research chemist at Avon, California. Since 1946 he has been vice-president in charge of manufacturing, western division.

WALLACE E. AVERY has been named assistant secretary of The Texas Co. He has been with Texaco since 1945, and since February 1951 has been assistant general manager of the company's industrial and public relations department. Prior to that, he served as an attorney in the Los Angeles offices.

R. L. ADAMS, Ardmore, Okla., has been promoted to the newly created position of assistant superintendent of Continental Oil Company's West Texas-New Mexico production division, with headquarters at Midland, Texas. He formerly was South Oklahoma district superintendent. Jack Marshall, Big Springs, Tex., assistant superintendent of Conoco's West Texas production district, will succeed Mr. Adams.

B. B. COLLEY, assistant regional geologist for Continental Oil Company's southern area, has been promoted to assistant manager of the company's geological section, it is announced by W. C. Hawk, geological section manager. He will continue to make his headquarters in Houston.

Mr. Colley joined Conoco at Houston in 1950 and two years later was promoted to assistant regional geologist for the company's southern area. Previously he spent 10 years as a geologist with another oil company in Colombia.

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W. A. Greeven

W. A. GREEVEN, representative of the Standard Oil Co. (N. J.) in Portugal, Spain and the North and West African countries, will join Creole Petroleum Corp. in Caracas on April 1, 1954. Mr. Greeven brings to his new responsibilities an extensive background of oil experience gained in the period of more than 25 years of service which he has spent with many of Jersey's affiliates in Latin America and Europe.

T. R. ELLIS has been appointed manager of the asphalt sales department of The Texas Co. to succeed D. R. Donlen, retired. Mr. Ellis joined Texaco in 1936 as an asphalt salesman. Recently he has been manager of the New York division.

C. W. STOSE has been appointed general manager of crude oil purchases and sales of The Atlantic Refining Co., succeeding the late J. Harry Lawson. Mr. Stose was assistant to the plant manager at Atlantic's Philadelphia refinery at the time of his appointment.

G. A. DAVIDSON, vice president of Standard Oil Co. of California, has been elected a director to succeed B. W. Letcher, retired. Mr. Davidson started with California Standard as a chemist in 1920 and became superintendent of the El Segundo refinery in 1933. He was named assistant to the general manager of manufacturing at the home office in San Francisco in 1938 and became assistant general manager in 1943. He was made a vice president in 1944.

G. A. Davidson

Progress Reported in Iranian Oil Discussions

(Continued from page 87)

that may be reached is the obvious necessity of a substantial loan to Iran to tide it over the financial crisis confronting it—a crisis which grows more acute as time progresses. The only suggestions thus far produced are that this should take the form of an advance by a consortium of international companies against stocks of oil on hand or to be produced or, alternatively, by a loan from interested governments.

Despite the evidences on both sides of good will and a desire to reach a settlement as soon as possible, final adjustments requisite to a solution of the Iranian oil problem remain to be made.

Following the report of the technical commission sent to Iran in February to appraise the condition of the Abadan refinery and other oil plants, a delegation of top officials of the companies that have been conferring in London will visit Iran to confer with members of the Iranian oil policy board on definite plans for concluding an agreement. One detail that might otherwise involve delay apparently has been removed by the reported decision of the Zahedi government that it will not be necessary to submit the final settlement to the Majlis for approval. As the elections now in progress have resulted in the return of pro-government members, such approval might not be difficult to obtain.

It is anticipated that the final adjustment will extend to Iran the same terms that the oil companies have extended to other Middle East countries. More important from the oil company viewpoint is a provision that will give them assurance of a steady and dependable supply of oil. The question of recompense to the Anglo-Iranian Oil Co. for loss of its properties is not expected to present a serious obstacle.

A main factor in the smooth and relatively rapid progress toward a solution of the complicated problem of Iranian oil has been the work of Herbert Hoover, Jr., special assistant to Secretary of State Dulles. Gravitating between London, Teheran and Washington and keeping modestly in the background, Mr. Hoover has kept things moving, reconciling conflicting views, removing obstacles and contributing from his deep technical knowledge and his experience as an advisor to governments to the search for an equitable solution of what is perhaps the most tangled and difficult problem ever to confront the world oil industry.

CURTIS M. KLAERNER of Beaumont, Texas, has been appointed manager of the Buffalo, N. Y., refinery of the Socony-Vacuum Oil Co. He succeeds Richard B. Price, who has resigned to accept a position with Standard-Vacuum Oil Co.

Mr. Klaerner was chief process engineer in the technical department of the Beaumont refinery of Magnolia Petroleum Co. He joined Magnolia in 1942 as a junior process engineer.

JOE B. HUDSON, for the past year acting area geologist for Humble Oil & Refining Co. in California, has been elected vice president of Monterey Oil Co. in charge of exploration and production operations. He joined Humble in 1934 and shortly thereafter was loaned to Lago Petroleum Co. at Maracaibo, Venezuela. He returned to Humble in 1937.

JOHN SIDNEY SMITH has been appointed public relations representative for Sun Oil Company's production department, Dallas, Texas. He has been the editor for the last seven years of the company's *Sun Production News,* a publication for oil field employees.

Erratum

On page 42 in the February issue in an article by J. P. Coleman, president of the National Stripper Well Association, a typographical error was made in showing the average production of all U. S. wells. The correct figure is 13.54 b/d and not 1,354 b/d.

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H. Wilkinson

L. F. FOOTE has been appointed senior petroleum engineer of The Ohio Oil Company at Findlay, Ohio. Mr. Foote has been associated with the company since 1935 and for the past 15 years has served as superintendent of various field areas and processing plants. Since 1949 he has been superintendent of the gas plant at Markham, Texas.

CHARLES ASHMUN has been appointed supervisor of oil movements for The Buckeye Pipe Line Co. with headquarters in the general offices at Lima, Ohio. Mr. Ashmun joined Buckeye in 1939 as a laborer in the field repair gang. In 1950 he was appointed assistant to the vice president and in this capacity was in charge of industrial relations.

HAROLD WILKINSON, a director of the Shell Transport and Trading Co. Ltd., has been appointed a director of two other companies in the Royal Dutch/Shell Group—The Anglo Saxon Petroleum Co. Ltd. and The Shell Petroleum Co. Ltd. His appointment to these directorships was effective September 9.

Mr. Wilkinson joined The Asiatic (now the Shell) Petroleum Co. Ltd. in 1922. In 1924 he went to Singapore and served there for four years before being transferred to Shell of South Africa Ltd. In 1931 he went to the United States where, some five years later, he was appointed president of Asiatic Petroleum Corp., New York. He is also president of Shell Caribbean Petroleum Co. In January 1949 he was elected to the board of The Shell Transport and Trading Co. Ltd.

Mr. Wilkinson was awarded the C.M.G. in the New Year's Honors List for 1946 in recognition of his services during the war as British petroleum representative in Washington, D. C. In 1951 he was awarded the United States Medal of Freedom with Bronze Palm.

ORVILLE L. BRATCHER, Oklahoma City, has been appointed industrial relations manager of Continental Oil Company's central region. Formerly assistant manager of the region's industrial relations department, he succeeds M. H. Shanahan, who has retired under the company's retirement annuity plan.

J. GRANT SPRATT has been elected president of Trans Mountain Oil Pipe Line Co. succeeding R. L. Bridges of San Francisco, Calif., who continues as a director.

Mr. Spratt has devoted the whole of his business career to the Canadian oil industry. From 1926 to 1938 he served the Province of Alberta as geological engineer and petroleum engineer.

In 1938 he became assistant manager of the Anglo-Canadian Oil Co. Ltd. He was appointed vice president and general manager in 1943 and in 1953 was appointed president.

PHILIP FELL has been appointed manager of export sales by Union Oil Company of California. He will have charge of sales originating in the Eastern Hemisphere and of shipments to that area. Mr. Fell has been with the company for five years in the sales promotion and market research divisions.

WILLIAM S. WHELAN, of Elizabeth, N. J., assistant general sales manager of the Tide Water Associated Oil Company's eastern division in charge of automotive sales, retired December 31, 1953 after over 30 years of service with the company.

J. G. Spratt

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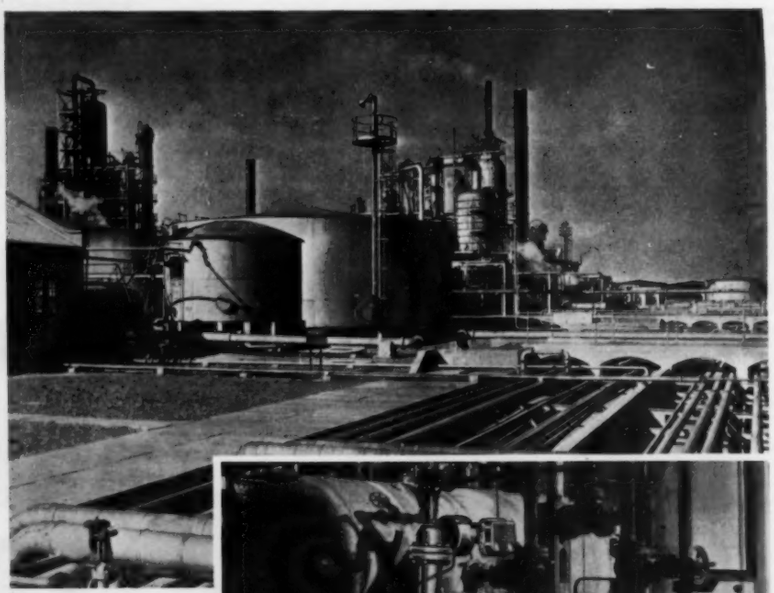

Above : View of Grangemouth Refinery of Scottish Oils Ltd.

Right : Fisher Level-Trol and Diaphragm Motor Valve on the Vacuum Unit (Condensate Drums). One of the many Fisher installations throughout this 55,000 bbl. per day Scottish refinery.

(Photographs by courtesy of Anglo-Iranian Oil Co. Ltd.)

king

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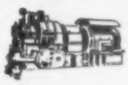

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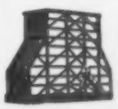

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E. H. Collins

O. V. Tracy

G. W. Poorman

MARION W. BOYER has been elected executive vice president and Edwin H. Collins vice president of Esso Standard Oil Co. Osgood V. Tracy and Glenn W. Poorman were elected directors.

Mr. Boyer, who has been associated with the company's manufacturing operations for 25 years, has been a vice president, director and member of the executive committee. He recently returned to the company after serving for three years as general manager of the U. S. Atomic Energy Commission.

Mr. Collins, whose career spans more than 30 years in the company's marketing operations, has been a director and member of the executive committee since 1949. He was formerly general manager of marketing.

Mr. Tracy, general manager of the chemical products department, has for more than 20 years been engaged in the commercial development of chemicals from petroleum with the company. He recently completed a term as director of the chemical division of the N. P. A.

Mr. Poorman, general manager of the supply department, joined the company in 1932 and subsequently held posts in manufacturing, marketing, and supply and transportation operations.

RAYMOND B. YOUNG, a refining executive with extensive experience in the oil industry of France, has been appointed general manager of Esso Standard S.A.F., French affiliate of Standard Oil Company (N.J.)

Mr. Young started his career in petroleum sales in the United States before going to France in 1921 as co-manager of La Mailleraye refinery. He served in that post until 1928, then as director and managing director of the Societe de la Mailleraye until it was merged with the Jersey Standard affiliate in 1935.

In the following year he was made assistant manager of the Port Jerome refinery. In 1937 he became a French citizen and was appointed general manager of both the Port Jerome and La Mailleraye refineries. In this post he supervised a program of destruction to deprive the advancing German army of needed fuel in 1940.

Mr. Young transferred to the Paris office of Esso Standard as industrial manager in 1946. Since 1952 he also has had charge of the company's refining, research, supply and transportation activities.

Succeeding Mr. Young in these activities will be August Schlageter, a veteran employee of the Port Jerome refinery.

R. E. WRIGHT has been named representative of Texas Petroleum Co. at Lima, Peru, with the title of assistant manager. He was transferred to his present post from Caracas, Venezuela, where he was assistant to the manager of Texas Petroleum Co., a wholly-owned subsidiary of The Texas Co.

Willard Grant, who has been chief accountant at Bogota, Colombia, succeeds Mr. Wright as assistant to the manager at Caracas.

CHARLES W. ALLEN, assistant chief geologist of William Ross Cabeen & Associates, consulting geologists, has gone to Palermo, Sicily, where he will become resident geologist for Macmillan Petroleum Corp. American International Fuel & Petroleum Corp. (a subsidiary of Gulf Oil Corp.) recently had a good show in a well located 2½ miles from Macmillan's 30,000 acre concession.

R. B. Young

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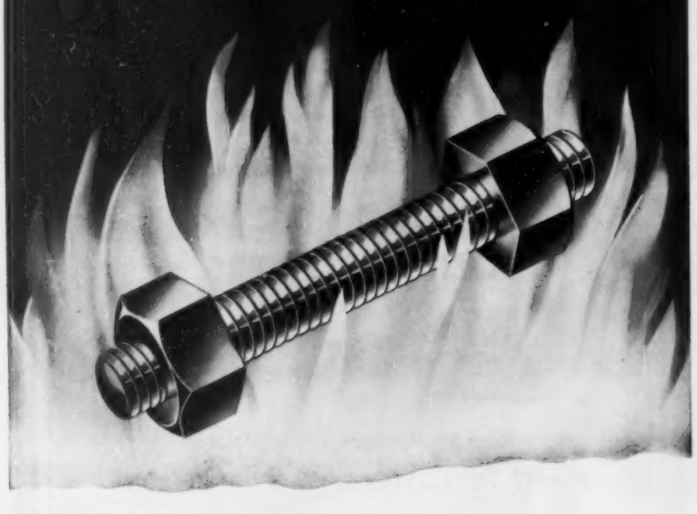

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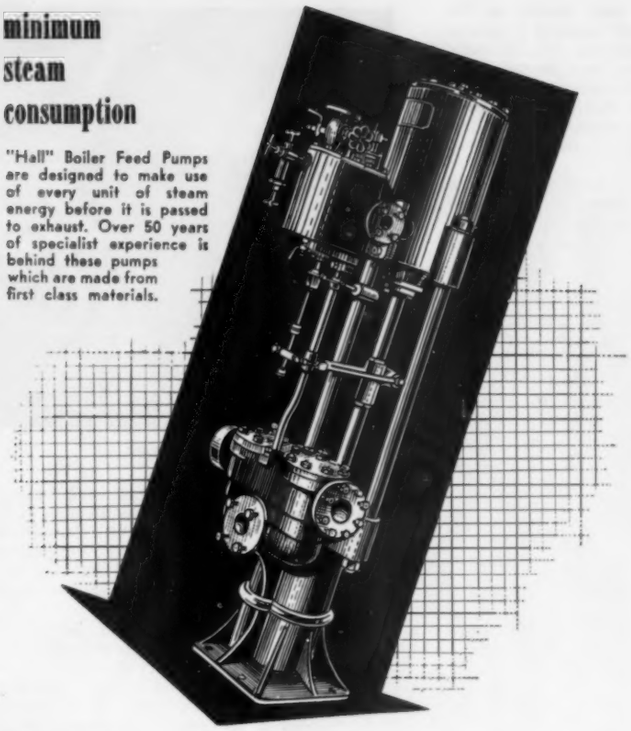

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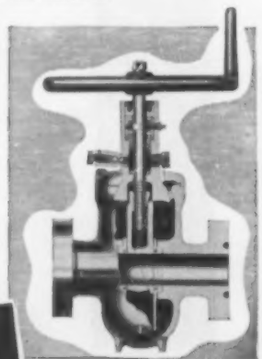

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JACKSON D. BREAKS and Eugene M. Geddes have been named directors of Middle States Petroleum Corp. Mr. Breaks is a vice-president of Chase National Bank and Mr. Geddes is a partner in the stock exchange firm of Clark Dodge & Co. Mr. Geddes is a director also of Western Union Telegraph Company, Manning Maxwell & Moore, Inc., and U. S. Smelting, Refining and Mining Co. and is vice president of the Association of Stock Exchange Firms.

J. E. FINLEY has been appointed division geophysicist for Continental Oil Co., with headquarters at Midland, Texas, it is announced by D. D. Christner, exploration manager for Conoco's southwestern region. Formerly division geophysicist at Roswell for Conoco, Mr. Finley succeeds Charlton Kerr, who has been promoted to the company's executive offices at Houston. G. H. Swenumson, Conoco's geophysical supervisor at Denver, Colo., has been made division geophysicist at Roswell.

E. R. KANHOFER has been named to the newly-created post of general manager of manufacturing activities of Universal Oil Products Co., Chicago. H. W. Grote was promoted to assistant manager of the laboratories to succeed Mr. Kanhofer. Dr. Julian M. Mavity, supervising research chemist, was appointed to another newly-created position, that of coordinator of service laboratories.

All three men are veteran employees of the company. Mr. Kanhofer celebrated his silver anniversary with UOP last September; Mr. Grote has been with the company for 15 years; and Mr. Mavity for 22 years.

JOHN S. REARICK has been appointed manager of engineering for The C. W. Nofsinger Co., Kansas City, Mo. He formerly was with The M. W. Kellogg Co. as director of research. He was in charge of pilot plant design, construction and operating during the development of fluid cat cracking, hydroforming and other processes.

R. M. Brown

RUSSELL M. BROWN has been appointed general manager of the refining division of California Texas Oil Company Ltd. Mr. Brown's last overseas position was that of general manager and vice president of The Bahrain Petroleum Co. Ltd. at its large refinery at Bahrain in the Persian Gulf.

Preceding the new appointment, his 16 years of service in the Middle East was recently marked by the award of the Honorary Order of the British Empire "in recognition of the outstanding services rendered to British official interests while employed as general manager of The Bahrain Petroleum Co. in Bahrain."

Mr. Brown's new position involves coordination of the operations of the growing list of refineries in which Caltex has an interest. There are now 11 such plants operating or under construction in nine countries of the 67 lands where Caltex markets oil.

H. R. BOLTON has been made manager of production for Deep Rock Oil Corp. He is succeeded as chief engineer by J. W. Hudson, who will also retain his duties as drilling superintendent. A. L. Rhodes will continue as Deep Rock's production superintendent. Dale Benedict will be manager of the land department; R. B. Hurlbutt will be in charge of the geological department; and S. T. Coleman will retain his title as assistant manager of exploration while devoting his efforts to making contracts with other companies.

W. R. HUBER has been named general manager of public relations for Gulf Oil Corp. Mr. Huber joined Gulf in 1935 as manager of advertising and sales promotion, continuing in this position until 1949 when he was made general manager of retail marketing, in charge of the sale of all Gulf products through retail outlets in the farm, airport, service station, home heating, and marketing fields.

W. R. Huber

Princes of serendipity

Someone has said that it cannot be accepted that scientists are naturally equipped with serendipity. But when we think of Newton and the apple falling on his head and farther back in scientific history, a Greek gentleman leaping from his bath exclaiming "Eureka", then can we doubt that the trained, ingrained habit of observation is ever asleep? Röntgen likewise "happened to notice" something that opened the door to a new world of physics. Fleming, too, in our time, "happened to notice" that a rare penicillin mould was a killer of bacilli. Princes of serendipity—kings some would say—they have their conscientious liegemen today.

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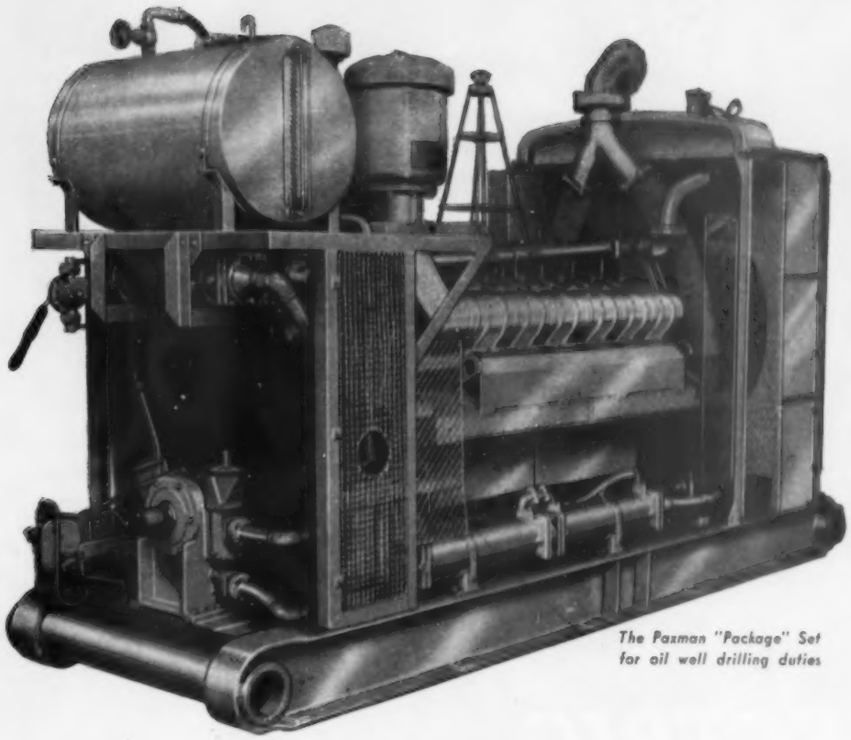

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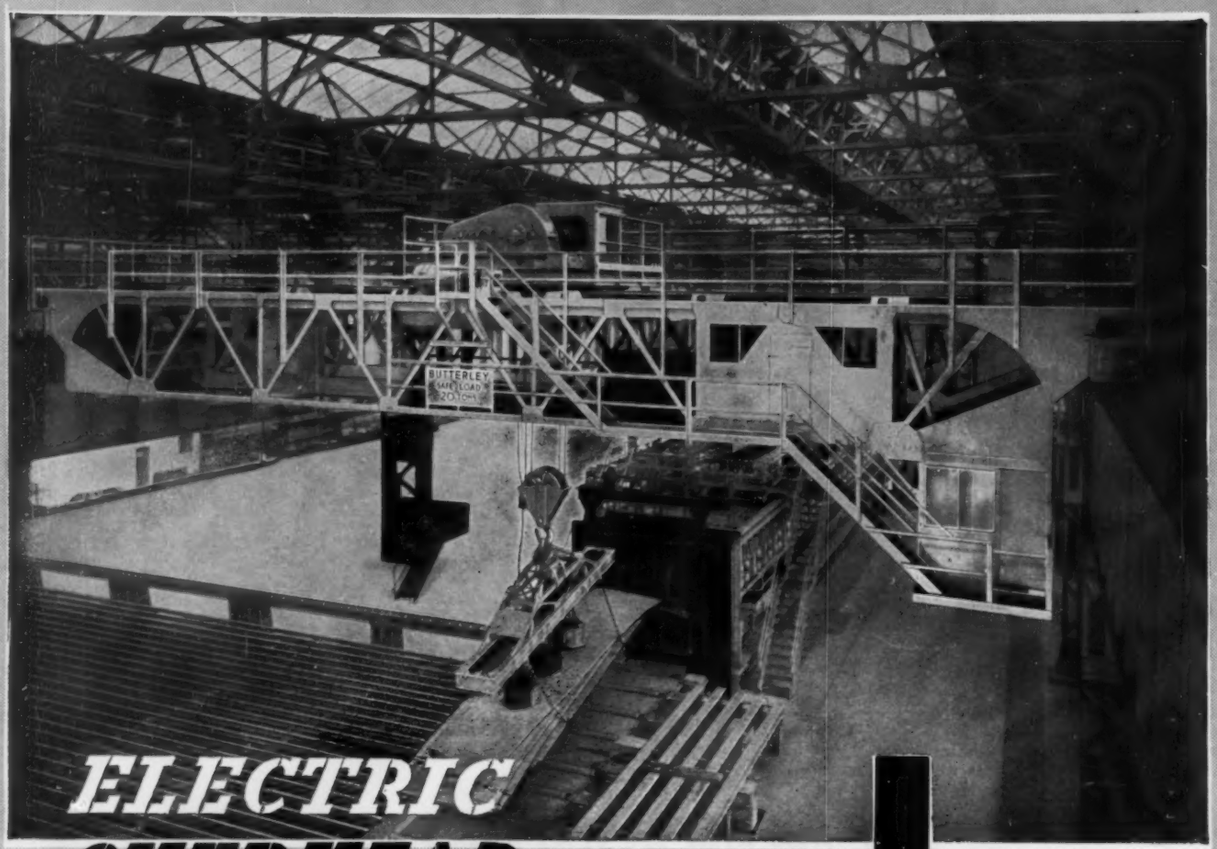

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L. G. Weeks

LEWIS G. WEEKS, a widely recognized authority on petroleum geology with 34 years of experience in many parts of the world, has been appointed chief geologist of Standard Oil Co. (N. J.). He has been the company's senior research geologist in the producing coordination department. As chief geologist he will continue as a member of the exploration division managed by G. Moses Knebel, and will specialize in geological problems connected with the world-wide search for oil by Jersey Standard and its affiliates.

Mr. Weeks joined Jersey Standard in South America in 1924 to engage in geological work in Venezuela, Bolivia, Chile, Brazil and Argentina before becoming chief geologist of Standard Oil Co. of Argentina in 1933. Later he was president of Standard Oil Co. of Bolivia. He transferred to New York as a senior staff geologist of Jersey Standard in 1938 and since then has specialized primarily in world geology.

MARC F. BRAECKEL, vice president of Sinclair Refining Co., has been appointed director of marketing to succeed James E. Dyer, who has been made president of the company. L. W. Leath was elected vice president and appointed general sales manager succeeding Mr. Braeckel, and L. J. Hoar, assistant general sales manager, was elected vice president.

Mr. Braeckel, a former president of the Richfield Oil Corp. of New York, was appointed assistant general sales manager of the Sinclair Refining Co. in 1949. In 1952, he was appointed vice president and manager of United States wholesale marketing and in 1953 was promoted to general sales manager.

Mr. Leath became eastern district manager in 1951 and in 1952 became assistant general sales manager. Mr. Hoar joined Sinclair in 1934, was promoted to southeastern district manager in 1949, and in 1952 was appointed assistant general sales manager, station sales, with headquarters in New York, which position he still retains.

FRED L. HARTLEY has been appointed manager of a new commercial development division established by Union Oil Co. in its research and process department. The division has been organized to extend the commercial application and licensing of Union's research and process activities. Mr. Hartley has been with Union Oil for 15 years as manufacturing process supervisor in charge of process design, and for the last three years as general superintendent of operations at Union's Los Angeles refinery.

M. A. ELLSWORTH, vice president and director of sales for The Fluor Corp. Ltd., Los Angeles, has announced the appointment of James P. Kneubuhl to fill the newly-created post of vice president, eastern area sales. Mr. Kneubuhl will remain in New York City where he has been district sales manager for Fluor for three years. H. T. Lorne has been appointed New York district sales manager.

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Appointments by American Development

The American Development Corp. announces that Raymond B. Bradstreet and Ralph Miller have become associated with its activities in the petroleum and allied fields. Mr. Bradstreet for many years held important technical positions with Standard Oil Development Co. and other Jersey Standard affiliates. He will serve as technologist.

Mr. Miller formerly was affiliated with the Chemical Foundation as director of research. He will devote himself to research and development work in the petroleum and chemical fields.

Buys Co-op Refinery

Sioux Oil Co. has acquired the Cooperative Refinery Association's refinery at Newcastle, Wyo. Sioux's refining capacity has now been increased to 5,000 b/d; 2,500 barrels at the present plant at Newcastle, 500 barrels at the Chadron, Neb., plant, and 2,000 barrels rated capacity of the new acquisition.

Virgil M. Yost, formerly with Bay Petroleum Corp. of Denver, Colo., has been elected a vice president of Sioux Oil Co. to assist in the general management of the company's affairs.

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New Geophysical Company

Formation of Societe Exploration Geophysique Rogers, a new geophysical company, has been announced by Sam D. Rogers, president of Rogers Geophysical Co. of Houston. The new company will have headquarters in Paris.

Robert du Pasquier is manager and will be in charge of all European operations for the new company. In addition to Mr. Rogers, owners are J. B. Nichols and J. R. Monkhouse of Houston, and William M. Krum of Caracas.

Combination Refining Economies

How combination processing can slash more than 20 percent from investment costs in building today's new oil refineries is revealed in Kellogram No. 1 (1954) just published by The M. W. Kellogg Co. According to Kellogg, skillful integration of a refinery can cut the cost of processing equipment from five to 15 percent, and the cost of offsite facilities (utility systems, tankage etc.) by as much as 40 percent. Equally impressive savings are to be had in direct operating costs of the combination refinery, including such items as labor, fuel, power, steam, water, and maintenance. The booklet is available from Kellogg's Refinery Process Division, 225 Broadway, New York 7, New York.

To Build Two Platformers

Quaker State Oil Refining Corp. has awarded construction contracts to Procon, Inc., for two Platformers at Emlenton, Pa., and St. Marys, W. Va. Each unit will have a capacity of 850 barrels a day. A third unit, capable of producing 1,500 barrels a day, already is under construction at the company's refinery near Bradford, Pa., and is scheduled to go on stream in the spring.

Pipe Line Welding Standards

A second edition of the "Tentative Standard for Field Welding of Pipe Lines" has been published by the American Petroleum Institute. The revised edition incorporates certain changes resulting from comments on the first edition issued in January 1953. Principal changes are in the radiographic section, where rather extensive revisions have been made. Copies of "API Standard 1104, Second Edition, Tentative Standard for Field Welding of Pipe Lines" may be ordered from the American Petroleum Institute, 50 West 50th Street, New York 20, at 50c per copy.

Furfural Booklet

A new 28-page booklet devoted to QO Furan Chemicals has just been published by the chemical department of The Quaker Oats Co., Merchandise Mart, Chicago 54, Illinois. Properties, uses and shipping information are described. This bulletin lists furfural-derived chemicals available in commercial and experimental quantities and gives properties and uses. An appendix describes bulk handling and storage layouts for furfural, furfuryl alcohol, tetrahydrofurfuryl alcohol, Furafil and Fur-Ag.

Gulf to Build Platformer and Ethylene Plants

A new ethylene plant and a new platforming plant, each the largest of its kind in the world, will be erected at the Port Arthur, Texas, refinery of Gulf Oil Corp. The ethylene unit, the second such to be built at the refinery, will have a capacity of 3 billion cubic feet of ethylene gas per year. This will represent an increase of about 10 percent in the nation's ethylene production. It will more than double the refinery's current production, raising the total to nearly 5.5 billion cubic feet yearly. Stone and Webster Engineering Corp. is contractor. The platforming unit capacity will be 29,000 barrels per stream day. The Fluor Corp. will build the Platformer.

Charles E. Maschal

Charles E. Maschal, manager of Sun Oil Company's Marcus Hook refinery, died February 17 following a sudden heart attack. He was 47. Mr. Maschal joined Sun as a still fireman at Marcus Hook refinery and, following a series of advancements, became manager of the refinery in 1951.

Japanese Study U.S. Methods

Fifteen Japanese businessmen, all specialists in industrial training, are in the United States to study training methods used by American industry. Standard-Vacuum Oil Co. is acting as host while the visitors are in the New York area. An intensive seven-course program has been organized for the group by Stanvac, to be conducted at training centers located in New York City and Elizabeth, N. J.

Esso Plans New Hydroformer

Construction of a 25,000 b/d Fluid Hydroformer costing approximately $12,000,000 began at the Baton Rouge refinery of Esso Standard Oil Co. on March 1. A contract has been awarded to C. F. Braun and Co. for the construction of the unit. Construction is expected to be completed in November.

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Careers in Geophysics

The Society of Exploration Geophysicists is publishing a vocational guidance brochure for free distribution to the nation's 30,000 high schools. The booklet, "Careers in Exploration Geophysics," has been prepared by the SEG public relations committee headed by R. C. Dunlap, Jr. of Geophysical Service, Inc., Dallas, and will initiate an expanded vocational guidance program for the society. The story of exploration geophysics, its opportunities, and how it has met the challenge to discover the earth's hidden treasures is portrayed vividly in a way that non-technical readers can easily understand.

The number of copies to be distributed will depend on the support industry provides, but SEG hopes to print at least 100,000 copies. Individuals or companies interested in the project may obtain sample copies of the brochure from the Society of Exploration Geophysicists, 624 South Cheyenne, Tulsa 3, Okla.

Crown Central to Install Houdriformer

Crown Central Petroleum Corp. will build a 5,000-barrel Houdriformer at its refinery near Houston, Texas. Although designed primarily for the up-grading of motor gasoline, the catalytic reforming unit also will be capable of producing aromatics and aviation blending stocks. The basic process designs were furnished by Houdry Process Corp.

Heads New District

Afton D. Puckett has been named manager of the newly-created Pittsburgh district of the du Pont petroleum chemicals division. He was formerly the division's sales representative in that city. The Pittsburgh district is part of the eastern region with headquarters in New York City. The new office will serve western Pennsylvania, West Virginia and western New York. It is located at 510 Alcoa Building, Pittsburgh 19, Pa.

New York Chapter of Nomads' 1954 officers: left to right, seated, Stewart D. Beckley, Norris L. Boulden and Herb E. Maland. Standing, R. E. James, Douglas L. Grill, Joe L. Comer, and Russ V. McIntire.

New York Nomads Elect

At the January business meeting of the New York chapter of Nomads, the following officers were elected to serve during 1954: Norris L. Boulden, president; Stewart D. Beckley, vice president; Herb E. Maland, secretary; Herman Gottwald, assistant secretary; Robert E. James, treasurer; Holland Smith, assistant treasurer; Joe L. Comer, sergeant at arms; Douglas L. Grill, assistant sergeant at arms; and Russ V. McIntire and A. A. Dill, regents.

McKee Widens Field

Arthur G. McKee & Company of Cleveland will broaden its activities in the engineering field, it has been announced by H. E. Widdell, president. A new industrial engineering division for the purpose of handling engineering contracts for industries other than steel and petroleum has been formed under the management of David K. Checkley, formerly vice president of the Cleveland consulting engineering firm of J. Gordon Turnbull, Inc.

Fluor Appoints Consultant

Dr. Thomas K. Sherwood, professor of Chemical Engineering at Massachusetts Institute of Technology, has been retained by The Fluor Corp., Ltd., of Los Angeles, as a consultant to its research and development division.

Recognized as one of the country's leading chemical engineers, Dr. Sherwood is a director of Arthur D. Little, Inc., and is a consultant for other companies in the petroleum and chemical fields. During World War II, Dr. Sherwood actively participated in armed forces' research and development programs, for which he received the Medal of Merit, the nation's highest civilian award.

McCullough Jet Cutter Booklet

A new, four-page technical bulletin on the Bottom Hole Jet Cutter, a special tool for fragmentizing junk, lost tools, etc., in a well, has been published by the McCullough Tool Co. Time saving and money saving features of these explosive, electric wire line jet cutting tools are fully described and illustrated. Actual field reports showing the many uses, applications and successful job accomplishments are included. Operation and detailed specifications are also given. Copies of this new Bulletin No. 701 are available on request from: McCullough Tool Co., 5820 South Alameda Street, Los Angeles 58, Calif.

Oil Exhibit Catalog

To help oil men and others responsible for the preparation of oil industry displays, the American Petroleum Institute has compiled a list of exhibits which are known to be available on loan in various sections of the country. The list has just been published in the form of a catalog containing illustrations, details of the exhibits, and the identity of the individuals or companies to contact. The 20-page catalog is called "Exhibits About Oil."

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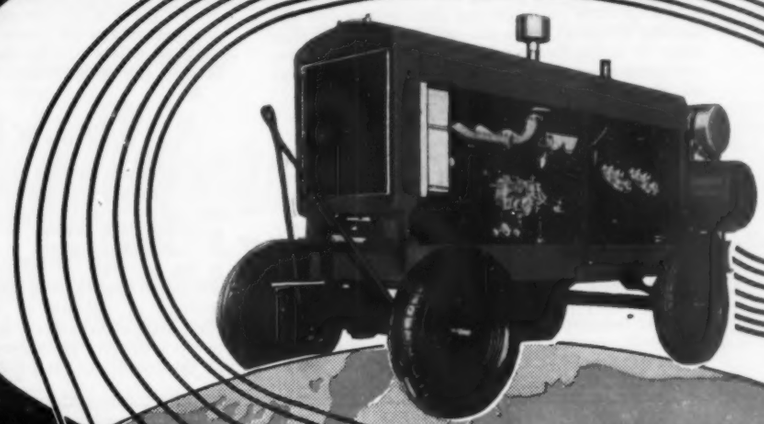

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Los Angeles Nomads

Shown above are incoming and outgoing officers of the Los Angeles chapter of Nomads. Left to right, seated: Harry Hester of McCullough Tool Co., secretary for 1954; Joe Schlarb of Chiksan Co., vice president for 1954 (sergeant-at-arms 1953); John Flanagan of Johnston Testers, Inc., president for 1954 (vice president 1953); Ox Morgan of Falcon Products, Inc., sergeant-at-arms for 1954 (deputy sergeant-at-arms 1953); Leo Cypher of Baash-Ross Tool Co., treasurer for 1954 (assistant treasurer 1953). Standing: Vern Mitchell, Security Engineering, assistant secretary 1953; Earl Atkins of Emsco Mfg. Co., assistant secretary for 1954; Jim Hughes of Lane-Wells Co., president, 1953 and regent for 1954; Bob Gaylord of Wagner-Morehouse, Inc., deputy sergeant-at-arms for 1954. Not shown, Bill Sargent of Sargent Engineering Co., secretary for 1953; Bob Craig of National Supply Co., treasurer for 1953; Jerry Engstrand, regent for 1953; Bill Wilson of Web Wilson Oil Tools, Inc., regent for 1954; and Earl Tavan of Ken Corp., assistant treasurer for 1954.

Book Review

Fundamentals of Reservoir Engineering, by John C. Calhoun, Jr.; published 1953 by University of Oklahoma Press, Norman, Okla.; 417 pages; $6.00.

Reservoir engineering is defined as that phase of engineering which deals with the transfer of fluids to, from, or within natural underground reservoirs. It is the core of petroleum engineering; the two names are nearly, but not quite synonymous.

The author divides the ideas of reservoir engineering into three categories: nature of the reservoir fluids, nature of the reservoir rocks, and the nature of rock-fluid systems. To the basic concepts involved in these categories must be added variables that deal with operations: geometrical configuration of the reservoir systems, boundary conditions of flow, types and characters of the fluids involved and sequence of operations undertaken. When the reservoir engineer has comprehended the three master categories and has learned exactly how the operating variables can control the behavior of a given rock-fluid system, he will have gone a long way toward formalizing his art.

In this book the author has done very much to help the reservoir engineer to accomplish this formalization. The subject matter is presented in six parts: reservoir fluids; reservoir rocks and rock-fluid systems; reservoir principles—material balance; reservoir principles—drainage and water influx; and well performance applications. The six parts are divided into a total of 161 sub-sections, giving the work an excellent subject matter organization that brings out the specific physical concepts and variables which apply to the environment within which petroleum and natural gas reserves exist. It will be a good addition to the petroleum engineer's book shelf.

Power Equipment Catalog

The complete line of International industrial power equipment is described in its entirety for the first time in a new 20-page catalog recently released by the International Harvester Export Co. This new catalog is available in both English (form E-1-D) and Spanish (E-2-D) from international industrial power distributors throughout the world, or from the International Harvester Export Company, Chicago 1, USA.

Vapor Saving Storage Booklet

Chicago Bridge & Iron Co., Chicago 4, Ill., has published a new 12-page booklet, "Hortondome Roof, Vaporsphere, Vaportank." This booklet describes the use of Hortondome Roofs, Vaporspheres and Vaportanks for reducing evaporation loss from standing storage tanks handling petroleum products. They provide a variable-volume vapor space which allows the air-vapor mixture above the liquid in tanks to expand and contract without venting vapor to the atmosphere.

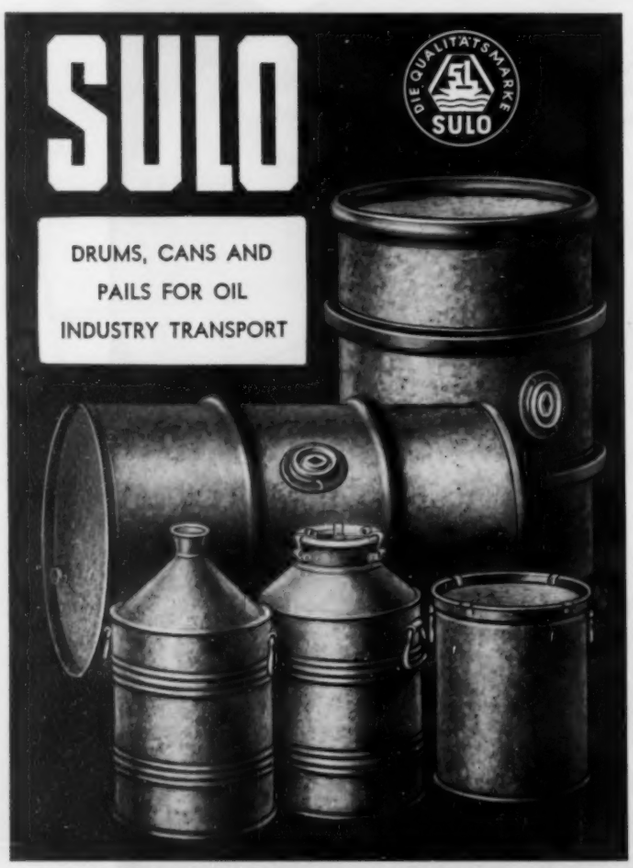
The booklet contains sketches showing each structure serving as a central storage unit in a vapor-saving system. A table of standard sizes is also included in the booklet.

Public Opinion Improves

Within the past three years the number of people in the United States who believe that the oil industry is highly competitive has increased by some 11 million. This is revealed by a nationwide survey conducted for the Oil Industry Information Committee of the American Petroleum Institute by Opinion Research Corp. of Princeton, N. J. Since a similar survey was made in 1950, the percentage of those who believe such competition exists has increased from 43 to 50 percent of the nation's total population.

New Coupling

The Master Enterprise Corporation of America, Tulsa, has designed a new coupling for connecting tubing or pipe in any size range. The MECA coupling requires no threading, flares, ferrules or tools. One of the principles of the coupling is the grooving of the interior of the coupling. At each end are grooves containing rubber O-rings of silicone or teflon rings depending upon use. The sleeve is tapered on the inside to allow for any variation in the outside diameter of the tubing or pipe.



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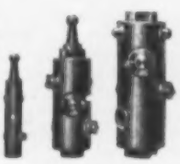

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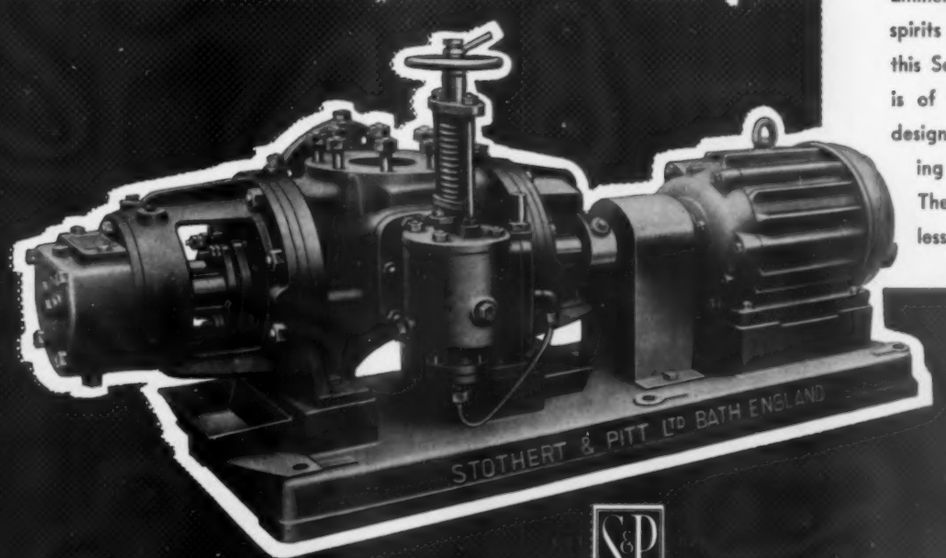

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INTERNATIONAL NEWS AND NOTES

Douglas Spuds in Second Peruvian Well

Douglas Oil Co. of California has spudded in its second exploratory well in Peru as part of an extensive drilling program designed to explore and develop two large concessions. The new well will be a 7,000-foot test of three main zones on the company's 122,000-acre Pacifico concession extending along approximately ten miles of the northern coastline of Peru. The well is situated on the beach about one mile south of the company's Lobitos No. 1 well and is one of several which will be started before the end of the fiscal year on March 31.

Lobitos No. 1, located on a 1,000 acre concession covered by an agreement with Petrolera Lobitos, is prospecting ahead at 5,119 feet and already has penetrated two oil zones. The upper zone, an 80-foot interval frm 2,520 to 2,600 feet, was chiefly oil sand and looked very good on the electric log and from sidewall samples, Mr. Krieger said. The second interval, from 3,370 to 3,500 feet, consisted of thin streaks of oil sand and shale. The well is being whipstocked from a site on the beach so as to bottom approximately 1,500 feet offshore.

To Study Oil Industry in Bolivia

At the request of the Bolivian Government, the United Nations Technical Assistance Administration is sending Robert J. Naif, a French expert, to help investigate the possibilities of expanding the country's petroleum production. He will study, check and evaluate reports of geological surveys on Bolivia's oil resources which have already been carried out, and help the authorities prepare a program to further the development of the country's oil industry. Mr. Naif has been associated with the Societe Cherifienne des Petroles, Morocco, for the past eight years as an engineer. He is a graduate of the Faculte des Sciences de Paris.

Timken President Reviews European Conditions

Reporting on European business conditions following a five week tour of company plants and sales offices, William E. Unstattd, president of The Timken Roller Bearing Co., says that business in Europe appears to be good. He is especially enthusiastic over the progress made by Western Germany, where industrial activity is at a high level.

A major obstacle in the way of more rapid European recovery, according to the Timken company president, exists in the burdensome restrictions on business imposed by import licenses. Import licensing, he feels, has a more deadening effect upon European economy than American tariff barriers.

Book Review

Review of Petroleum Technology 1951; Edited by George Sell and published 1953 by Institute of Petroleum, London W.1., England; 360 pages; 50s.

This is the 13th edition of this annual review; it covers progress of petroleum technology during 1951 and in general follows the lines of the previous volumes. The 21 chapters contain nearly 3,000 references to articles that appeared in the technical press during the period under review, which in some cases extends over more than one year. Each chapter is written as a running commentary on related developments within the subject of the chapter, which makes it easy for the reader to get a mental picture of what researchers are doing in that subject.

Indonesian Exports Rise

Exports of petroleum and petroleum products by Indonesia reached the highest point in history last year, amounting to more than 9.7 million metric tons. Increase over 1952 was 30 percent. The total was nearly 50 times larger than the amount shipped by Indonesia in 1946, the first postwar year of renewed exports, and was 60 percent above the peak prewar year of 1938.

Value of 1953 petroleum shipments by Indonesia was placed at 2.3 billion rupiahs, or about $200 million, contrasted with the 30 percent rise in volume.

Cat Cracker for Geelong

Shell Petroleum Co. has announced the beginning of construction early in 1954 of a catalytic cracking unit at its Geelong refinery near Melbourne, Australia, with an intake capacity of 650,000 tons of cracking stock per annum. Concurrent with the building of the cat cracker will be the erection of a vacuum feed preparation unit, and later a polymerization plant will be added.

This project forms part of a construction program designed to make Geelong one of the largest and most modern refineries in the British Commonwealth. The first stage, a crude distillation unit of 1,750,000 tons capacity, is due to be completed in the Spring of 1954. Meanwhile the Geelong Harbor Trust is dredging the port approaches to a depth of 32 feet and constructing a special jetty to accommodate ocean going tankers up to 18,000 dwt.

Acquires Peruvian Concession

Petrolera Amotape S.A. has acquired 174,000 acres of oil lands in northern Peru, adjacent to the International Petroleum concession of Brea & Parinas and Lobitos oil fields of Compania Petrolera Lobitos, and surrounding the lands contracted by the Peruvian Pacific Petroleum Company, a subsidiary of Cities Service Company.

The lands have been acquired by contract with Empresa Petrolera Fiscal (government-owned company) which has two producing wells on the property developed under the direction of its manager engineer, Fernando Noriega Calmet.

The agreement between Petrolera Amotape S.A. and Empresa Petrolera Fiscal is authorized by Supreme Resolution No. 73 of September 29, 1953, article 147 of the Petroleum Law No. 11780, and article 363 of the regulations.

Book Review

Lubricant Testing; Introducing Recent Developments In Testing Technique, by E. G. Ellis, B.Sc., F. Inst. Pet. Published 1953 by Scientific Publications (Great Britain) Ltd., Wellington, England, 232 pages. 37s. 6d. plus postage.

Based on practical experience of lubricating testing over a period of 25 years, E. G. Ellis, a London consultant on lubrication, has written a book designed to fill a gap in available knowledge of testing techniques applicable to this important phase of lubricant usage. It is the author's conviction, based on his long experience, that the books of standard methods issued by institutes and societies for testing materials, though of unquestionable value, are not in themselves sufficient for guiding the working oil and grease chemist, especially in the case of small firms. Hence Mr. Ellis pays particular attention to beginners in all oil laboratories, chemists whose primary interest is in non-oil products, and engineers and salesmen who need some insight into the use and significance of tests on oils and greases.

Shell of Canada Acquires Gander Facilities

Shell Oil Company has acquired the assets of the Shell Company of Newfoundland. Formerly controlled in the United Kingdom, Shell of Newfoundland was principally engaged in supplying aviation products at Gander international airport. By this arrangement Shell of Canada takes over a marine storage terminal at Lewisporte and a storage plant at Gander airport. Present plans call for an increase in the storage capacity at Gander as well as the installation of a hydrant system for refueling aircraft. Over-all administration of Shell's Newfoundland operations will be handled by the company's Montreal division office.

Since 1936, when construction of Gander commenced, Shell has been supplying aviation products at this famed airport. Now the gateway for a multitude of air travelers, it serves an average of 58,000 passengers a month during the summer. Its strategic location, a link between Europe and North America, makes it one of the world's most important airports. It is estimated that $100,000,000 has been spent developing Gander, and further important additions are planned.

To Enlarge Pipe Line Capacity

An expansion program which will boost the carrying capacity of its 188-mile Sarnia products pipe line by 40 percent has been announced by Imperial Oil Ltd. The $1,000,000 project, which includes two new pumping stations, will raise the throughput of the line from 39,000 to 55,000 barrels a day.

Pumping stations will be built at London and at Waterdown, where spur lines for Hamilton leave the main line. Construction will be completed by the fall of 1954.

Crude Runs Higher

Anglo-Iranian Oil Company's refineries in Britain processed 67,340,000 barrels of crude oil last year, an increase of 18,500,000 barrels over 1952, according to preliminary figures. The increase resulted from the commissioning of the company's new 80,000 barrel refinery on the Isle of Grain in Kent, south of London.

Book Review

A Survey of American Interests in the Middle East; 120 pages; edited by Frances Mattison; published by The Middle East Institute, 2002 P St., N.W., Washington, USA; price $2.75.

A book certain to be of value to all those interested in international affairs is a *"Survey of American Interests in the Middle East,"* just issued by The Middle East Institute of Washington, D. C. It presents a brief summary of the background of American relations with nations in that area and recent developments affecting these relations, and includes statistics of United States trade with countries bordering the eastern Mediterranean, the Persian Gulf and the Indian Ocean. Following the text is a directory of business firms, religious and educational organizations operating in the Middle East and a list of government agencies and international associations concerned with that region in which the United States participates.

The book contains a great amount of information not readily accessible elsewhere and a very complete index makes it easy for the reader to locate any specific topic to which he may wish to refer.

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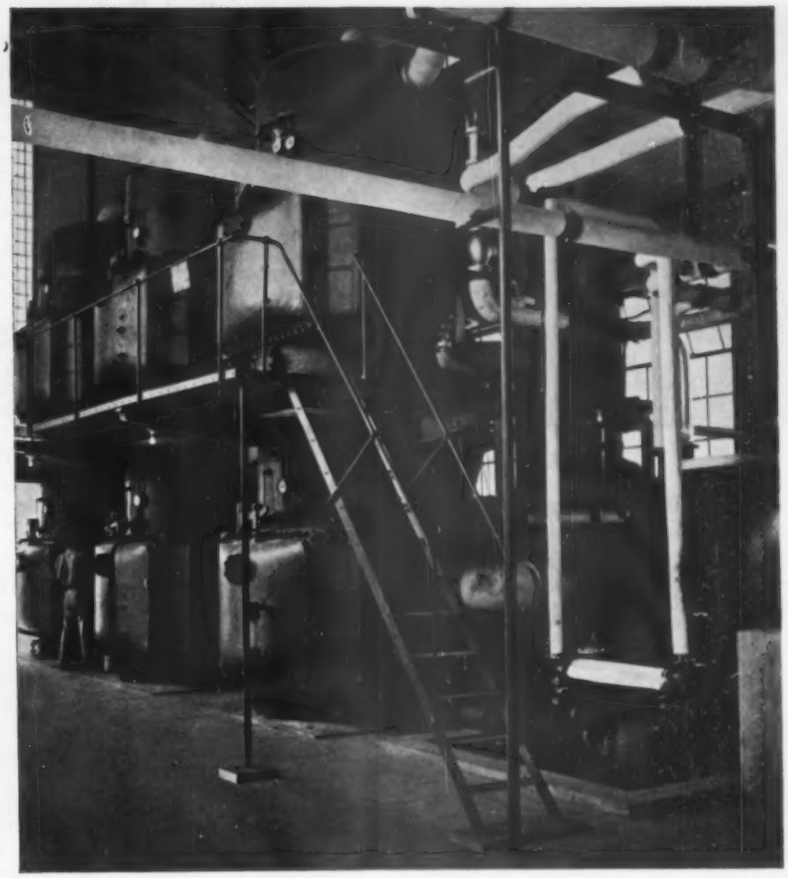

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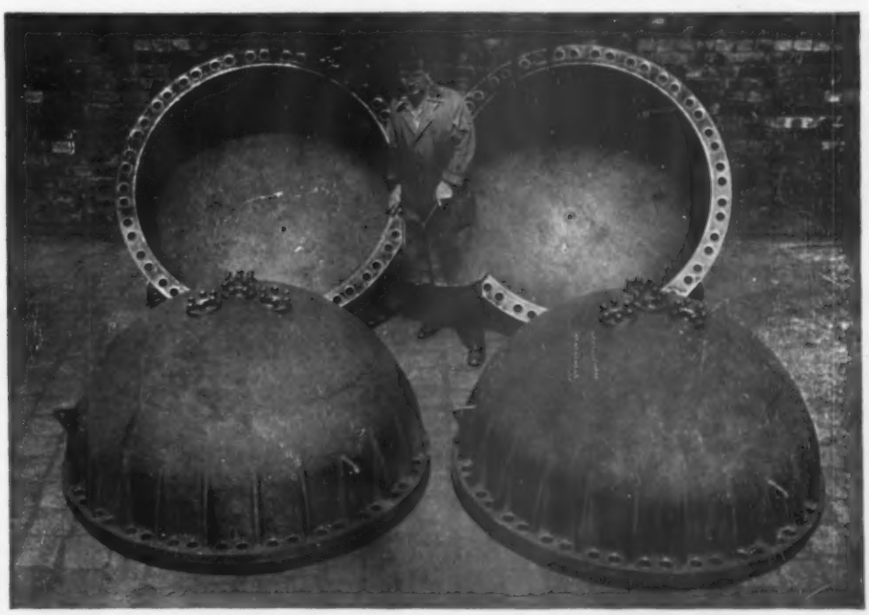

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Oilfield Sales Manager for National Supply

M. E. Swaim has been appointed general manager of oil field sales for The National Supply Co. suceeding T. J. Walne, who resigned. Mr. Swaim joined the company in 1925 at Tulsa, Oklahoma, and served subsequently in various sales and field engineering capacities. He spent two years in the company's engineering department and in 1944 was appointed manager, plant products division, at Houston, becoming sales manager of production equipment in 1948.

Water Flood Report

The Interstate Oil Compact Commission announces publication of a new pamphlet entitled "Summary of Water Flood Operations in Illinois Oil Pools During 1952." Copies may be obtained without charge by writing to the Headquarters Office of the Interstate Oil Compact Commission, Box 3127, State Capitol, Oklahoma City 5, Oklahoma.

Blaw-Knox Appoints Maddocks

Robert R. Maddocks has been appointed chief process engineer of the western headquarters of Blaw-Knox Company's chemical plants division. Mr. Maddocks has been with the Pennzoil Co., Arthur G. McKee & Co., Petrochem Development Co., and the Bechtel Corp.

McCullough Appoints Sales Engineer

K. K. Campbell has been appointed sales engineer at the Houma, Louisiana branch of the McCullough Tool Co. according to an announcement by O. J. McCullough, vice-president. Mr. Campbell is a graduate of Louisiana State University, class of 1942, and during World War II served as an infantry officer.

K. K. Campbell

Book Review

A Review of the Geology and Activities in the Uinta Basin, by A. M. Current, geologist for the Carter Oil company at Vernal, Utah, has been published by the Colorado School of Mines. Mr. Current discusses the various oil-producing fields and the geology and surface indications of oil and other hydrocarbons found in the region. Included are detailed formation reports furnished by the California Company on two of its wells in the Uinta Basin: Red Wash Unit No. 4, with core descriptions itemized from 3,500 to 5,830 feet; and Gusher Unit No. 3, with drilling results recorded from 5,150 to 8,633 feet. Six maps are included. The publication sells for 50 cents.

A Study of Asphalts and Asphaltic Materials, by George W. LeMarie, associate professor of petroleum refining at the Colorado School of Mines, is another recent publication. His is a guidebook to asphalts, including their manufacture and testing. Included is a section on recent research in bituminous materials and 23 illustrations. This book sells for $1.50.

Both publications may be ordered directly from the Department of Publications at the Colorado School of Mines.

Waste Disposal Manual

The American Petroleum Institute has published Volume IV of its comprehensive Manual on Disposal of Refinery Wastes entitled "Sampling and Analysis of Waste Water." It discusses latest procedures for dealing with effluent waters from refinery operations and should be of great value to analytical laboratory supervisors and others engaged in pollution control work.

This is the first edition of Volume IV. It brings up to date some material contained in Volume I, entitled Waste Water Containing Oil, which is now in its fifth edition. With Volume II, Waste Gases and Particulate Matter (Fourth Edition) and Volume III, Chemical Wastes (Second Edition), the new publication brings the monumental Manual one step nearer completion. It is in loose leaf form for easy revision as new procedures are developed and is available, complete with a limp leatherette binder, at the price of $5 from Institute headquarters at 50 West 50th Street, New York 20, N. Y. All orders should be directed to J. A. McNally.

Oil-Tight Push Buttons

The full line of G-E oil-tight push buttons, indicating lights, selector switches, and accessories is described in a new 16-page publication, GEA-5779B, announced as available from the General Electric Co., Schenectady 5, New York.

Standard Petroleum Measurement Tables

NBS Circular 140, *National Standard Petroleum Oil Tables*, and its supplement was withdrawn from circulation January 1, 1954. The information given in Circular 410 has now been incorporated in the *ASTM-IP Petroleum Measurement Tables* recently issued by the American Society for Testing Materials and the Institute of Petroleum (Great Britain). The new tables are available from the American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pennsylvania, at a cost of $8.75 ($6.50 to ASTM members). Tables 5 and 7 of the ASTM-IP tables may also be purchased from the ASTM in separate reprint form for $1.00 and 50 cents, respectively, with a reduction on quantity purchases. Table 5 covers the reduction of observed API gravity to API gravity at 60° F. Table 7, which replaces the *Supplement to NBS Circular 410*, covers reduction of volume to 60° F against API gravity at 60° F. Other individual tables are being reprinted.

The withdrawal of Circular 410 was originally scheduled for July 1, 1953, but was postponed in order to allow time for the re-publication of the tariffs of pipe line companies and the necessary changes in other legal and regulatory documents which makes special reference to Circular 410.

Drake Museum Given Smith Anvil

The anvil on which W. A. "Uncle Billy" Smith pounded out the tools he used to drill the world's first oil well for Col. E. L. Drake has come to rest in Drake Well Museum. The anvil had been stored for decades in a tool house at the Titusville home of "Uncle Billy's" granddaughter, Mrs. Mae Sheehan, who died Oct. 16, 1953. Howard M. Levy of Titusville, who purchased all Mrs. Sheehan's personal property, turned the anvil over to the museum.

Tools which were fashioned on Smith's anvil were presented to the Drake Museum in 1949 on the 90th anniversary of the drilling of the well. The full drilling outfit weighed little more than 100 pounds and cost Drake $76.50, according to an entry in the blacksmith's notebook.

Oil men erected a granite shaft in memory of Uncle Billy Smith on October 18, 1952 on what had been his unmarked grave in the small cemetery at Hannahstown, Pa., near Tarentum, on the Butler-Freeport highway. The epitaph for Uncle Billy reads:

"Here lies the blacksmith of Tarentum, Uncle Billy Smith, who made at his own anvil the tools he used to drill the world's first oil well at Titusville, Pa.

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"The petroleum industry's millions of workers salute the memory of the original oil well driller, William A. Smith, in tribute to his loyalty, courage, and craftmanship."

Howard Slater Honored by Nomads

Howard Slater, purchasing agent, New York purchasing department of the Gulf Oil Corp., who retired February 26, was guest of honor at the New York chapter of Nomads' February meeting held at the Hotel Biltmore in New York City. One hundred and seventy-two of Mr. Slater's friends from the petroleum industry were on hand to pay him their respects on the eve of his retirement. In the above photograph Mr. Slater (left) is shown receiving from Norris L. Boulden, president of the New York chapter of Nomads, a receipted bill for a desk which they presented to him for his Florida home.

Seismograph Booklet

Explaining seismograph work to land owners is the purpose of a brochure now being distributed by field parties of Geophysical Service, Inc. Titled "Finding a World of Oil: Facts About GSI and Its Relation to You," the publication gives a simplified explanation of seismic work and tells how the presence of a seismograph field party is beneficial to local economy. Copies are distributed primarily by permit men who contact land owners in preparation for conducting a seismic survey.

Rotary Operations Increase

Rotary rigs in operation in the United States and Western Canada increased to a total of 3,079 during the second week of December, according to the report of Hughes Tool Co. This figure compares with 2,962 operating rigs on the corresponding date in 1951 and is only 102 below the record set on December 10, 1951.

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H. C. Otis, Jr.

L. M. Wilhoit

H. B. Schramm

C. M. Schwab

Otis Makes Appointments

Otis Pressure Control, Inc., Dallas, begins its 26th year of specialized pressure control operations in the petroleum industry with the announcement of four new executive appointments.

Herbert C. Otis, Jr., has been named executive vice-president of the company and of its manufacturing affiliate, Otis Engineering Corp. Lowell M. Wilhoit is now vice president in charge of sales and service and Harry B. Schramm is vice-president in charge of engineering and manufacturing. Carl M. Schwab has been named chief engineer.

Mr. Otis, son of the company's founder and president, joined the firm in 1949 after graduation from Southern Methodist University. After working in the field with the company's well service units, he joined the home office staff in Dallas as vice-president.

Mr. Wilhoit has spent his entire business career with Otis. He was graduated from Oklahoma A&M College as a mechanical engineer and has worked as a field engineer for Otis in Houston, Corpus Christi, and Oklahoma City. In 1938 he became district superintendent for Otis at New Iberia, La. He was subsequently promoted to assistant chief engineer in Dallas, chief engineer, and finally general superintendent and sales manager. During an expansion program that doubled the size of the Otis office and plant facilities, Mr. Wilhoit was assigned as production manager for the manufacturing company.

Mr. Schramm was graduated from Texas A&M College as a petroleum engineer. Following graduation he was associated with his father in oil field construction and production work. In 1940 he became district engineer in the West-Central Texas area for Fain-McGaha Oil Corp., and in 1946 he joined Otis as a field engineer. Mr. Schramm has done extensive development work on Otis safety valves, widely used in high-pressure oil and gas wells, and has been active in the design of many tools now in universal use by the industry.

Mr. Schwab studied petroleum engineering at Texas A&M College for three years and was graduated from the University of Minnesota with a degree in civil engineering. He joined Otis in 1949 in its oil well calipering department in Houston, later being transferred to New Iberia as division manager, then to Dallas as administrative manager and liaison director.

Book Review

Material Classification Manual, prepared by The Petroleum Accountants Society of Oklahoma; 64 pages, pamphlet bound; published by Ross-Martin Co., Box 800, Tulsa 1, Okla. (1953); $2.50 postpaid, graduated downward to $1.50 per copy in quantities of 25 or more.

This new and revised manual lists alphabetically material and equipment used in producing, manufacturing, pipe line, exploration and research operations of the petroleum industry. Classification is made between controllable and non-controllable items for accounting treatment.

The information is offered by the Society as a suggested meeting ground in connection with the accountings for joint interest operations, and as a yard stick for reference in connection with internal procedures, particularly accounting distribution.

Chemical Construction Officer

J. H. Ruskin has been elected executive vice president of Chemical Construction Corp. G. I. Seybold and Martin de Simo have been elected vice presidents, and Thomas P. Forbath has been named assistant to the president.

Book Review

Petroleum Concessions: Technical and Economic Considerations Relating to Their Issuance, by Arturo Hidalgo R. Issued by the Ministry of National Education, Caracas, Venezuela; 165 pages.

Into this work Dr. Arturo Hidalgo R., well known Venezuelan petroleum engineer, has compressed an instructive discussion of technical and economic considerations relating to the management of petroleum resources, the control of production, the problems of conservation and avoidance of waste.

The feature of the work which undoubtedly will arouse the most interest and discussion, however, is Dr. Hidalgo's observations on the question of the Venezuelan government's policy on the issuance of concessions for oil exploration and exploitation. This has been a subject of argument pro and con since 1943. During the decade that has passed, the government has not granted any new concessions, although the petroleum law of 1943 permits such grants. The policy of the government seems to have been one of postponement rather than of intention to discontinue the development of new areas, but meanwhile applications from national and international groups have been piling up.

Among the reasons advanced for this policy of inaction are the facts that large undeveloped tracts are included in existing concessions held by various companies and that these will be put under examination and operation as may be required. Certain influential individuals maintain that development of the country's oil resources should not be hurried since by keeping them in reserve, the national benefits will be spread over a long period and larger returns will be obtained since the price of oil and its products seems certain to advance. One faction opposes any further grant of concessions to international interests, but holds that resources should be developed in future by Venezuelan nationals.

Against these and other allegations, Dr. Hidalgo presents a case based on realism and common sense. His main point is that oil production in Venezuela is increasing at a much faster rate than the increase of proved reserves, so that in no great time the outflow of this critically valuable national product must begin to fall off. Considering that it takes four or five years for an application to pass through the legal formalities, and an additional six or eight years for the concessionaire to produce oil, the matter of resuming the issuance of concessions is urgent. It is evident that available local capital is far from sufficient for the task. The present Venezuelan oil .law is a model of its kind; it fully protects the national interest, and gives the foreign concessionaire his proper reward while leaving him little opportunity to abuse his privilege. The international oil trade is a fiercely competitive one and if Venezuela lags in maintaining its position, its place will quickly be taken by others.

Refining Glossary

Technical terms which oil refiners use day in and day out are defined, pronounced and reproduced in shorthand in a new glossary just published by the division of refining of the American Petroleum Institute. It is expected to become an invaluable reference manual for executives and their secretaries, chemists, laboratory technicians, refinery personnel, editors, writers, and others interested or involved in refining terminology.

Its title is a "Glossary of Terms Used in Petroleum Refining." Handsomely bound in a durable hard cover, the book contains more than 2,000 colloquial and technical phrases commonly used in oil refining operations. More than two years of committee work went into the selection of the phrases and their definitions.

Both the Gregg and Pitman shorthand symbols are reproduced in the appendix for all 2,000 words contained in the glossary.

Hard cover editions of the book may be obtained through Lacey Walker, Secretary, American Petroleum Institute, 50 West 50th Street, New York 20, N. Y., at $6.00 each .

Fluid Mapper Developed

Rex E. Cheek, a graduate student at the University of Oklahoma working under a Stanolind Oil and Gas Company fellowship, has completed a project involving the use of a fluid mapper in the secondary recovery of oil. He developed a simple fluid mapper and used dyes to trace the configuration of different kinds of liquids in a reservoir. His equipment consisted of a piece of Durock, a plaster-like, porous rock that allowed the dyes to seep through it in the same fashion that liquids would move through underground rock. This inexpensive fluid mapper helps determine the most efficient underground patterns for the maximum recovery of oil from a reservoir. The fluid mapper does not eliminate other methods, but supplements them. Results are not quantitatively accurate, but do provide sufficient information to make the technique valuable to engineers and oil companies.

Rheem Names New Officers

The board of directors of Rheem Manufacturing Co. has announced the appointment of C. V. Coons, a vice president and member of the board, as resident director in New York, and of William S. Rheem II as general manager. Mr. Coons and Mr. Rheem were formerly general manager and assistant general manager respectively.

Worthington Appointment

John J. Jirasek has been appointed sales manager of Worthington Corporation's newly created southwestern regional sales organization. He will be responsible for coordinating Worthington affairs in the company's offices at Dallas, Houston, New Orleans, El Paso and Tulsa. He has been manager of the petroleum and chemical industries division. He will make his headquarters at the C. & I. Life Building, Main Street, Houston.

J. J. Jirasek

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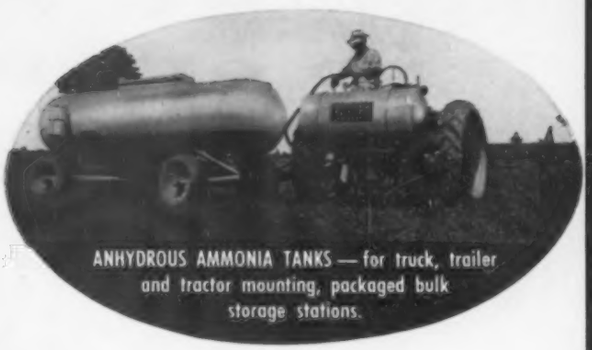

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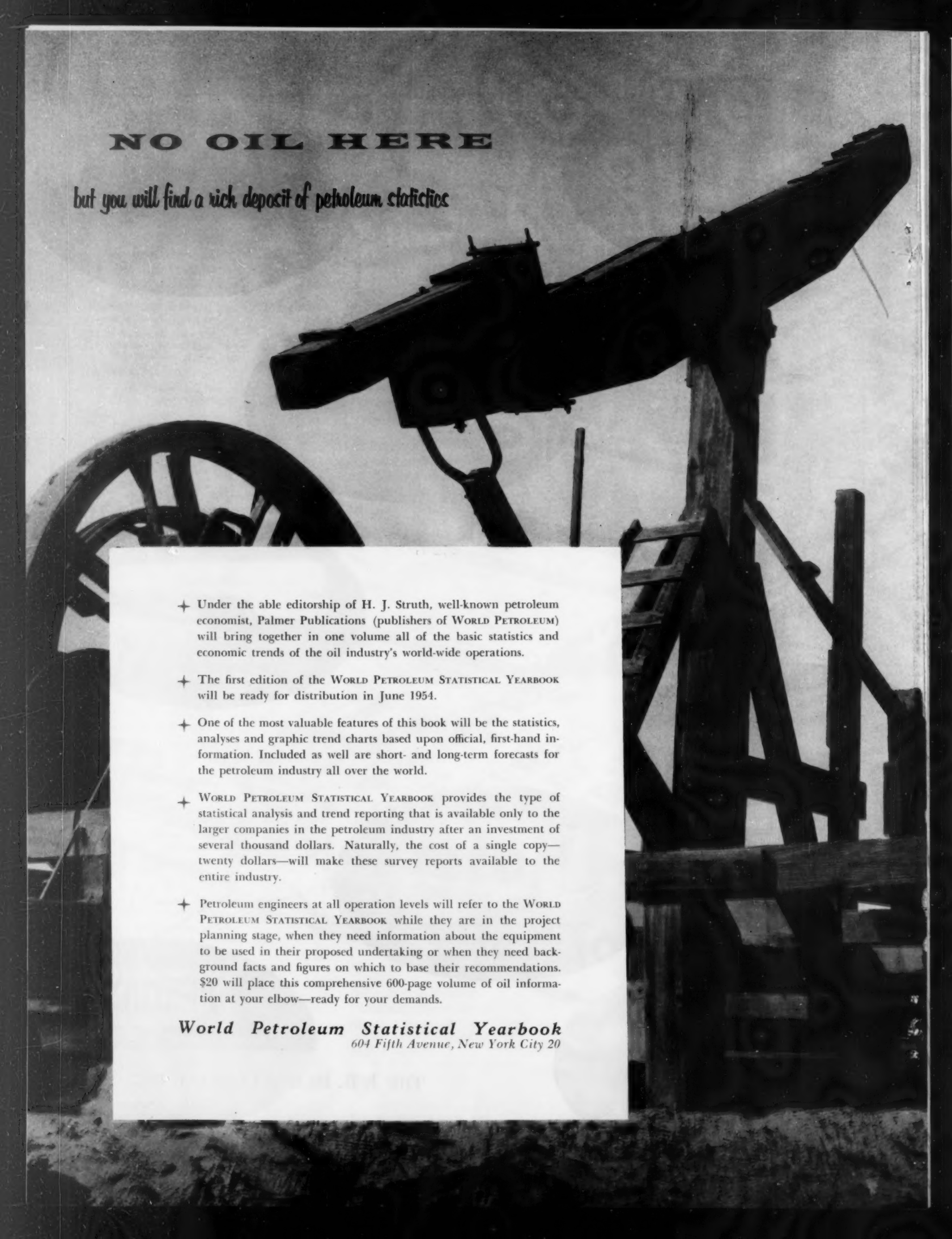

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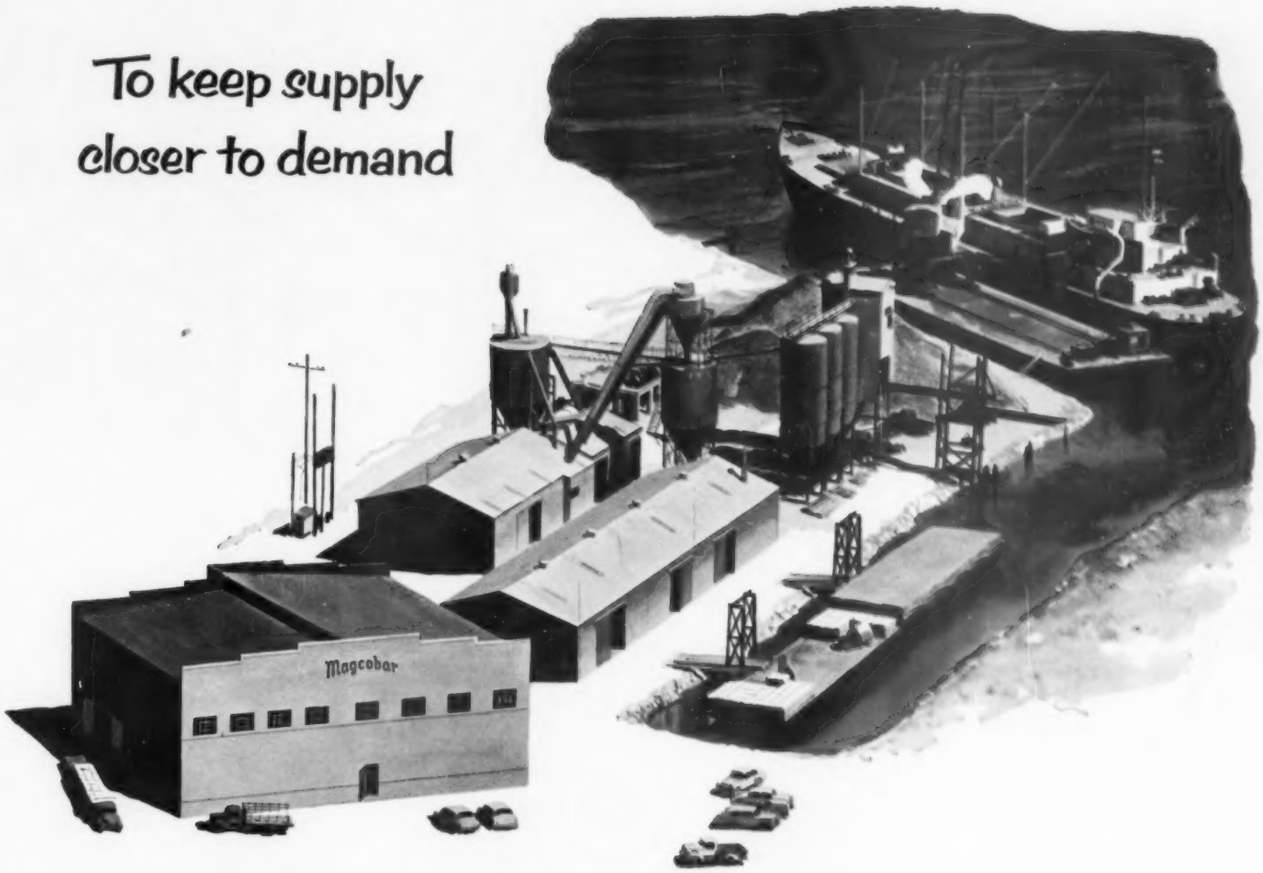

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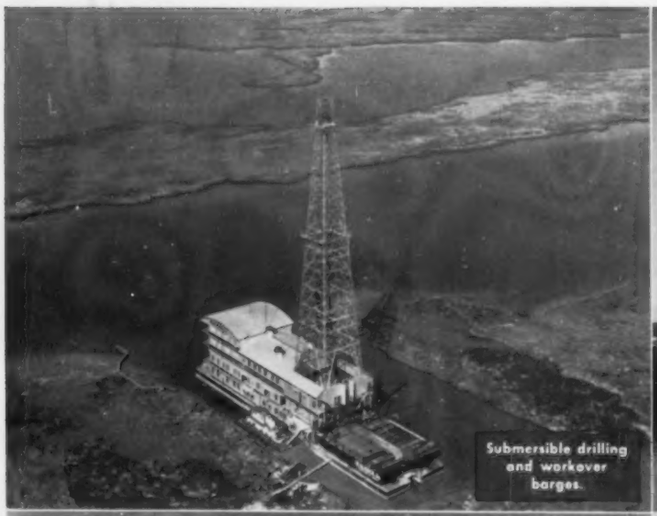
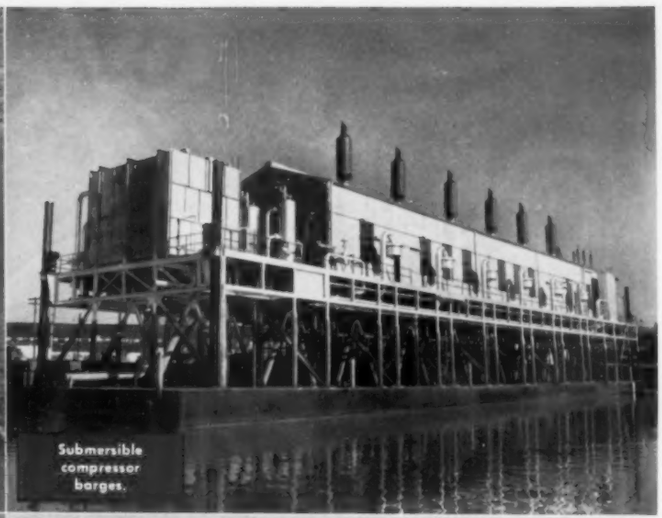


Submersible drilling and workover barges.



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